



Tube bundle extraction and transporting

After having carried out all the operations foreseen in the **testing** phase and having excluded any possibility of partial reparation on site, or it is simply necessary to wash the bundle, it is necessary to remove it from the shell.



For this purpose Maus Italia has developed a complete series of tube bundle pullers which fall into two categories, **AERIAL** and **SELF-PROPELLED**, which are available for **ON-SHORE** and **OFF-SHORE** operations ,on request, with special preparation for operation in dangerous classified areas.

The **AERIAL** type, designed for use with the help of a crane, is capable of reaching all the work positions accessible overhead and normally is the most manageable and economic tube bundle puller.

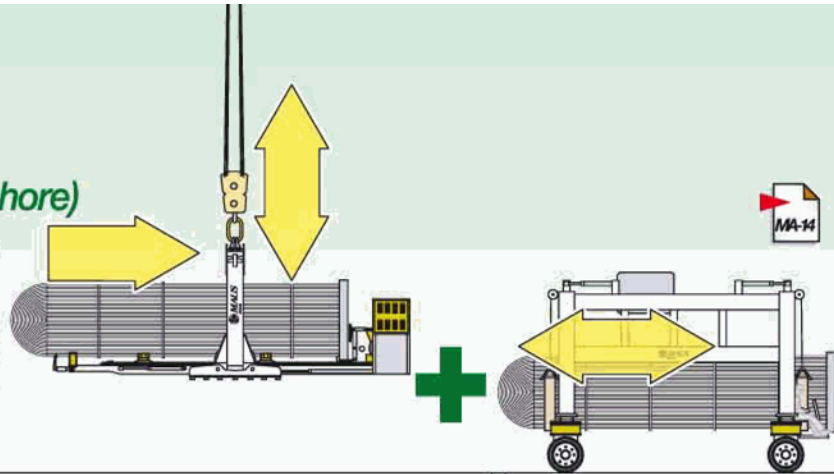
The **SELF-PROPELLED** type has the advantage of not needing a crane but clearly has a more determined and limited range of use.

Let's examine them in detail:



Mef express + Mammut (on-shore)

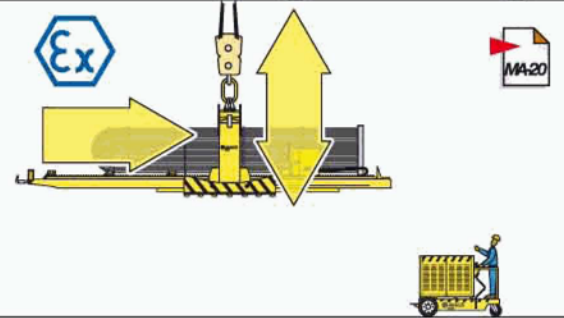
The quick hooking **aerial tube bundle puller** is produced in various sizes for tube bundles up to **95 T (143300 Lb)** and lengths up to **12,5 m (41 ft)**. This model works well in combination with the absolutely new **Mammut** tube bundle transporter, suitable for rapid transport to the work bench for washing on **workshop**.



Mef express NAVY (off-shore)

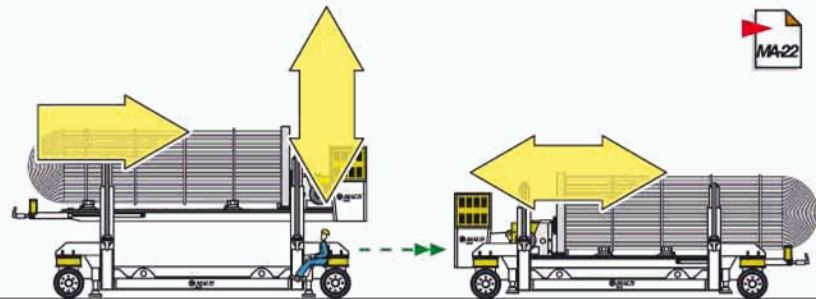
Aerial bundle extractor, suitable for ocean platforms and **FPSO** installations. This is a special version of the **Mef express**, designed and manufactured for meeting the specific needs of safety and off-shore maneuverability. Specific construction solutions are assessed case by case depending on the motor drive and limitations (of weight and size).

One of these **NAVY** solutions envisages the separated **Van Motor** drive unit including one converted **diesel engine (Explosion-proof)**, assembled on a **self-propelled trolley**.



Mef mobil (on-shore)

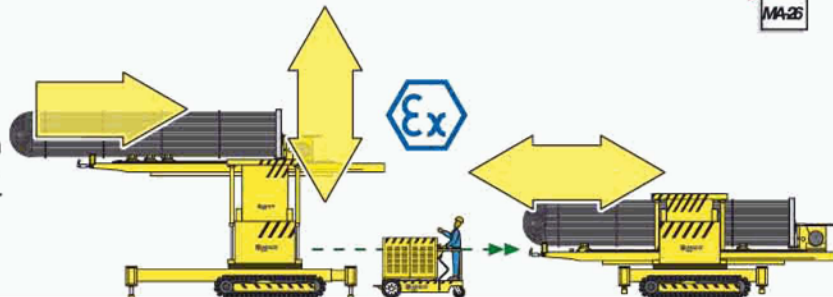
Self-positioning remote controlled bundle puller for extraction, hoisting and movement of tube bundles. This tube bundle puller has been designed for cases of difficult access. It is completely self-sufficient, as is presented as a global solution in petrochemical plants for the extraction and transportation of tube bundles.



Mef mobil NAVY (off-shore)

Self-positioning remote controlled bundle puller for extraction, hoisting and movement of bundles on platforms and FPSO.

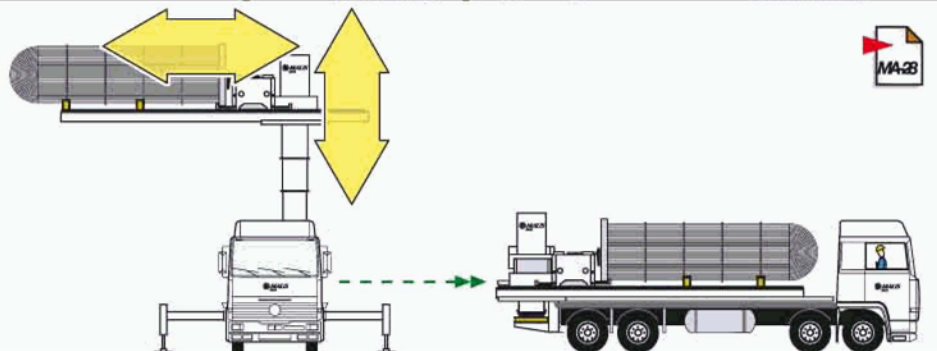
This special version of the **Mef mobil** is available in different sizes and also designed taking into consideration the possibility of maneuvering on board. It has two parts (like the **Mef Aerial NAVY**), one operative and the other for control, consisting of the hydraulic unit powered by an explosion-proof version of the diesel motor, installed on a self-propelled trolley.



Mef Truck

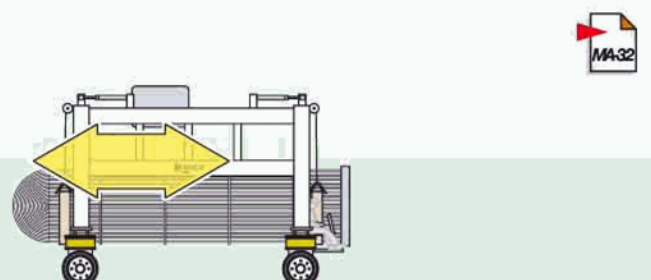
Mef truck, thanks to the original project of the telescopic rotating column, allows the quick pulling/inserting of the bundle. Once the truck is positioned, it is easy and **quick to lift** the extractor and to proceed with the extraction.

This system is particularly advised for the maintenance companies which operate continuously in the petrochemical plant field.



Mammut bundle transporter

This specially designed machine provides a brilliant solution to the problem of **moving tube bundles** inside installations from the point where they are extracted to the washing area or the **workshop** inside the installation, eliminating the use of trucks and mobile cranes and speeding up considerably the loading and unloading operations carried out just a few centimeters from ground level in complete safety.



Aerial bundle extractors (on-shore)

Mef express

Quick hooking tube bundle puller

Mef express tube bundle puller is the quick hooking version of the already existing **Mef** model. It has been entirely designed and manufactured by Maus Italia for the maintenance of heat exchangers tube bundles in petrochemical plants. The hydraulic hooking of the tube plate makes it possible to quickly insert and pull out the tube bundles when the refineries are at a shutdown with a consequent work time reduction.

The great solidity and sturdness of the structure as well as the innovative improvements make this machine extremely reliable.

Mef express puller is proposed in different standard dimensions according to the weight, the length and diameter of the tube bundles. A portable console enables the remote control of all the operations with consequent reduction in the personnel and increase in the final safety margins. In the diesel version a console with wireless remote control is available. It is supplied with **diesel or pneumatic motorization**.

The **Mef express** tube bundle puller, which already gives good performance in the **basic version**, is supplied on request with a series of very interesting **optional features** illustrated in the next page.

Diesel or pneumatic driving units are available

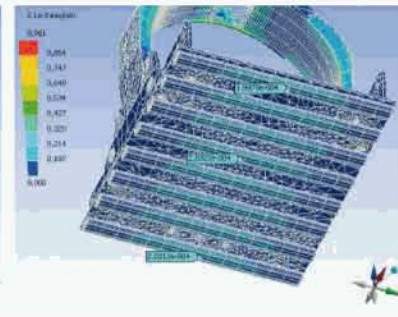
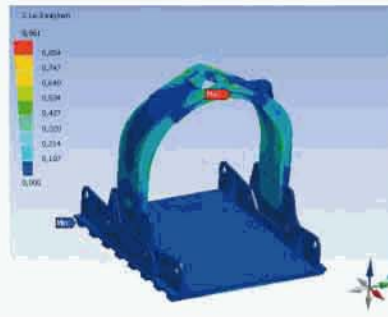
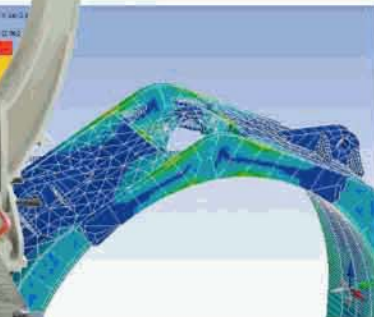
Easy to operate

Performing and reliable

Affordable prices

Tested solidity
(lifting test)

Advanced design



Motorization

Bundle extractors can be supplied with **Diesel engines** or **air motors**. Motors executions suitable for hazardous classified working area are available on request (complete with **Atex conformity** declaration).

Customized executions

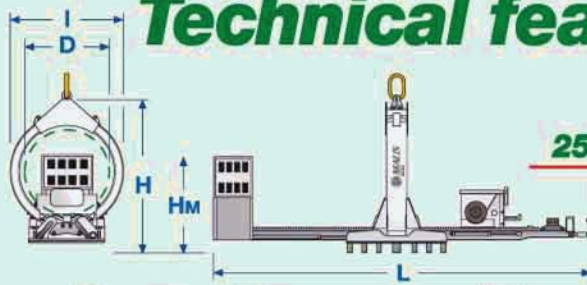
Maus (**ISO 9001 certified**) can supply also customized bundle pullers to meet special requirements from the customer (submitting all necessary docs / drawings / calculations).

On request,
SPECIAL VERSION
for low temperatures

Technical features



Shipping by container



Bundle dimensions	1300		1600		1700		2000		2000		2200*		2500*	
	65		65	75	65	75	65	75	100	75	100	100	125	
Tube sheet O.D. D mm	1300		1600		1700		2000		2000		2200		2500	
Length mm	6500		6500	7500	6500	7500	6500	7500	10000		7500	10000	10000	12500
Max lifting capacity T	10 (15)		15 (22,5)		22 (33,3)		35 (52,5)		35 (52,5)		45 (67,5)		65 (97,5)	

Mef dimensions	1300		1600		1700		2000		2000		2200*		2500*	
	65		65	75	65	75	65	75	100	75	100	100	125	
Width I mm	1600		2000		2050		2300		2300		2900		3000	
Height H mm	2000		2500		2600		2800		3000		3300		3650	
Length L mm	7800		8100	9100	8100	9100	8100	9100	11600		9100	11600	11600	14100
Height (motor) HM mm	2150		2250		2250		2250		2250		2250		2250	
Weight Kg	4850		6200	6400	6500	6700	8250	8600	10800		12000	14000	16000	18500
Pulling max speed m/min	2,5		2,5		2,5		2,0		2,0		2,0		1,5	
Pulling force T	20		30		35		50		50		65		90	



Bundle dimensions	1300		1600		1700		2000		2000		2200*		2500*	
	65		65	75	65	75	65	75	100	75	100	100	125	
Tube sheet O.D. D "	51		63		67		78		78		87		98	
Length Ft	21		21	24	21	24	21	24	32		24	32	32	41
Max lifting capacity Lb	22000 (33000)		33000 (49500)		48500 (72750)		77100 (115650)		77100 (115650)		99200 (148800)		143300 (214950)	

Mef dimensions	1300		1600		1700		2000		2000		2200*		2500*	
	65		65	75	65	75	65	75	100	75	100	100	125	
Width I Ft	5.3		6.6		6.8		7.6		7.6		9.5		9.9	
Height H Ft	6.6		8.2		8.6		9.2		9.8		10,8		12.0	
Length L Ft	25.6		27	30	27	30	27	30	38		30	38	38	46.3
Height (motor) HM Ft	7.0		7.4		7.4		7.4		7.4		7.4		7.4	
Weight Lb	10700		13700	14100	14400	14800	18200	19000	23800		26500	30900	35300	40800
Pulling max speed Ft/min	8.2		8.2		8.2		6.6		6.6		6.6		4.9	
Pulling force Lb	44000		66100		77100		110200		110200		143300		198400	

* For heavier bundles please contact us

** With Diesel driving unit

** Designed to support (under testing condition) a static load of 1.5 times the nominal load capacity

* Available in disassemblable rocker arm version

Nominal (Static load capacity for testing)

Aerial bundle extractors (on-shore)

Mef express

Standard supply

Diesel version

Diesel engine
(air cooled)



Pneumatic version

Air motor



Manual local command
on back side



Manual local command
on back side



Electric Portable
remote control

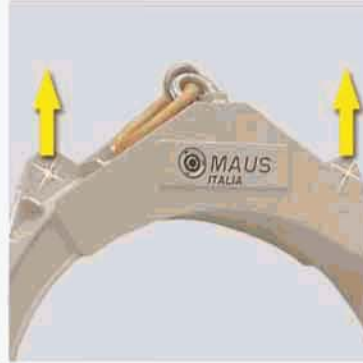


MA-16 MALIS

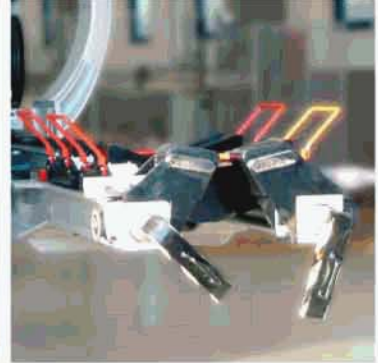
Pneumatic portable
remote control



Lifting point
alternative system



Hydraulic vices
for shell flange clamping



Main carriage
for continuous
pulling/pushing



Two hydraulic cylinder
for balancing action



Large base
of rocker arm
for balancing



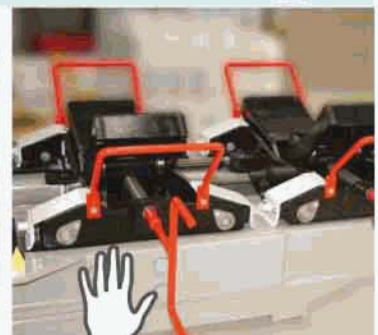
* Disassemblable rocker
arm in 3 pieces for transport
also by container



* Only for 2200
and 2500 models.

MA-15

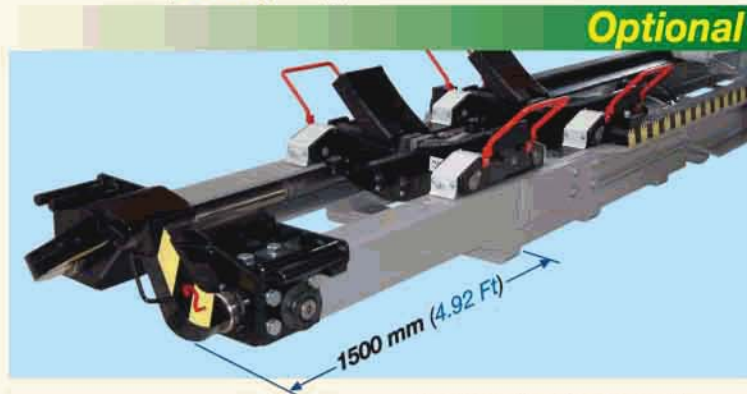
New bundle supports
with manual
adjustment



Mef express

Optionals

Removable Extension
1500 mm (4.92 Ft) long



Water cooled
diesel engine



Portable wireless
remote control



Adapters for small
diameter tube bundles



Hydraulically Bundle
supports with cust.
shape
(baffle-rod bundle)



Stainless steel guards
for sliding parts



Hydraulic telescopic
extended arm for bundle
insertion



Hydraulically controlled
bundle supports

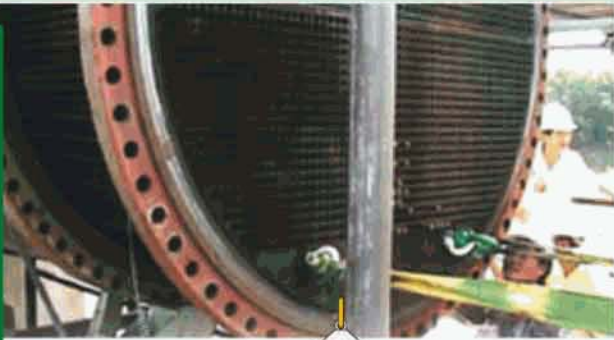


Aerial bundle extractors (on-shore)

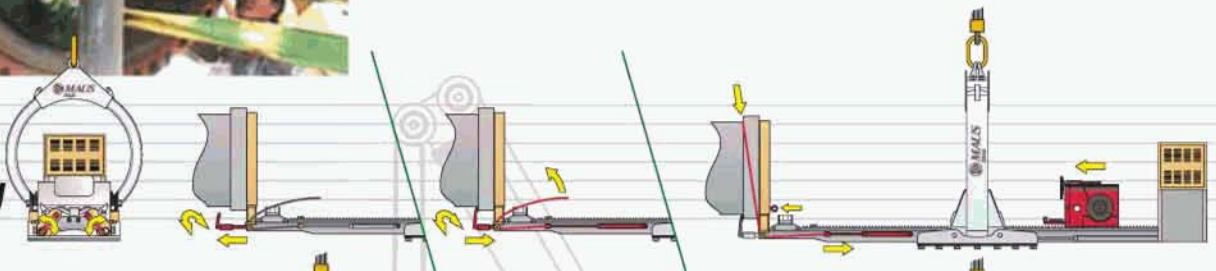
Mef express

Extraction sequence

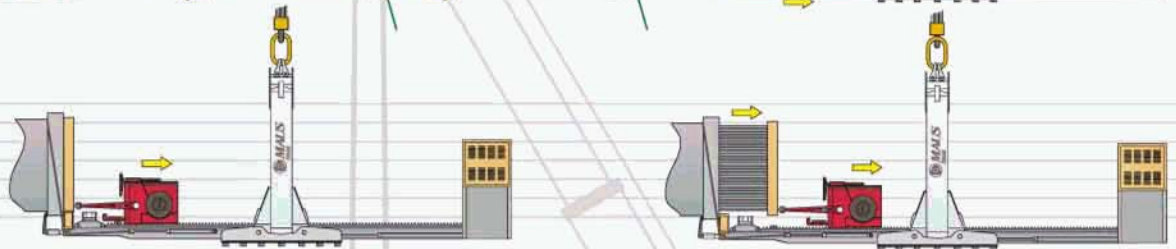
The main operations are shown below in sequence.



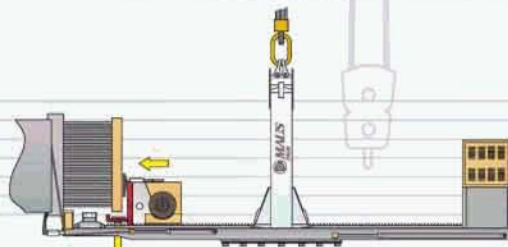
Shell blocking



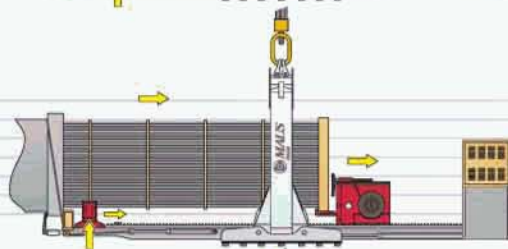
Pull with cable



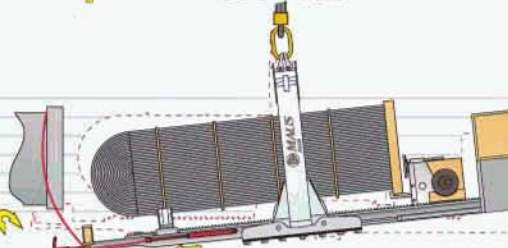
Hooking
Start of pulling



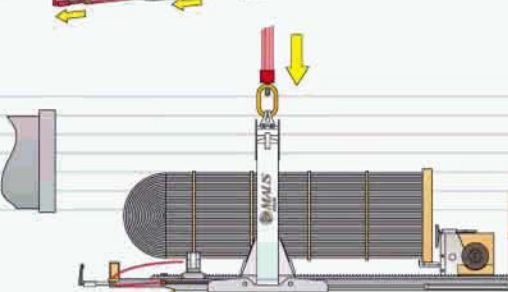
Pulling
Holding

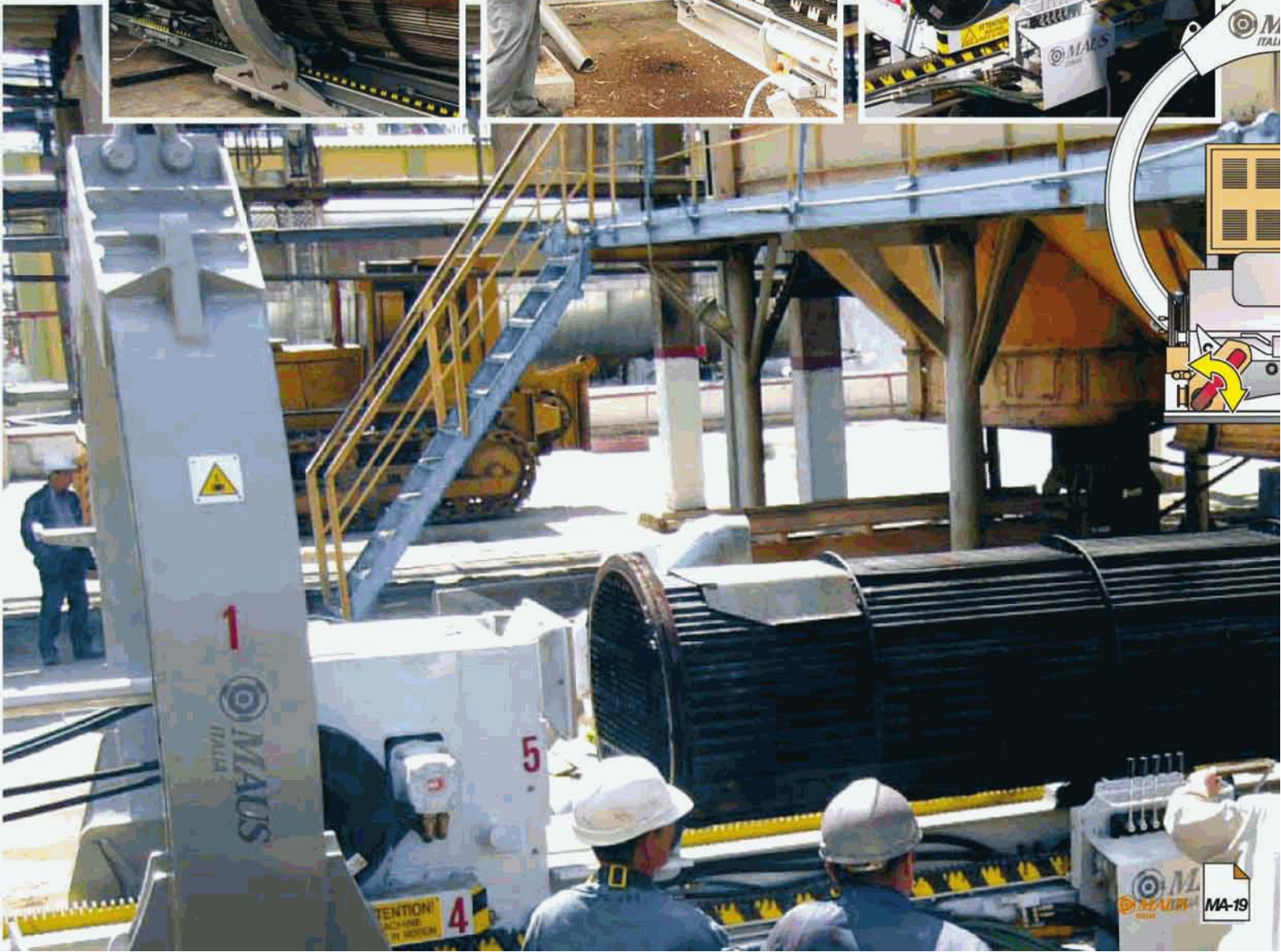
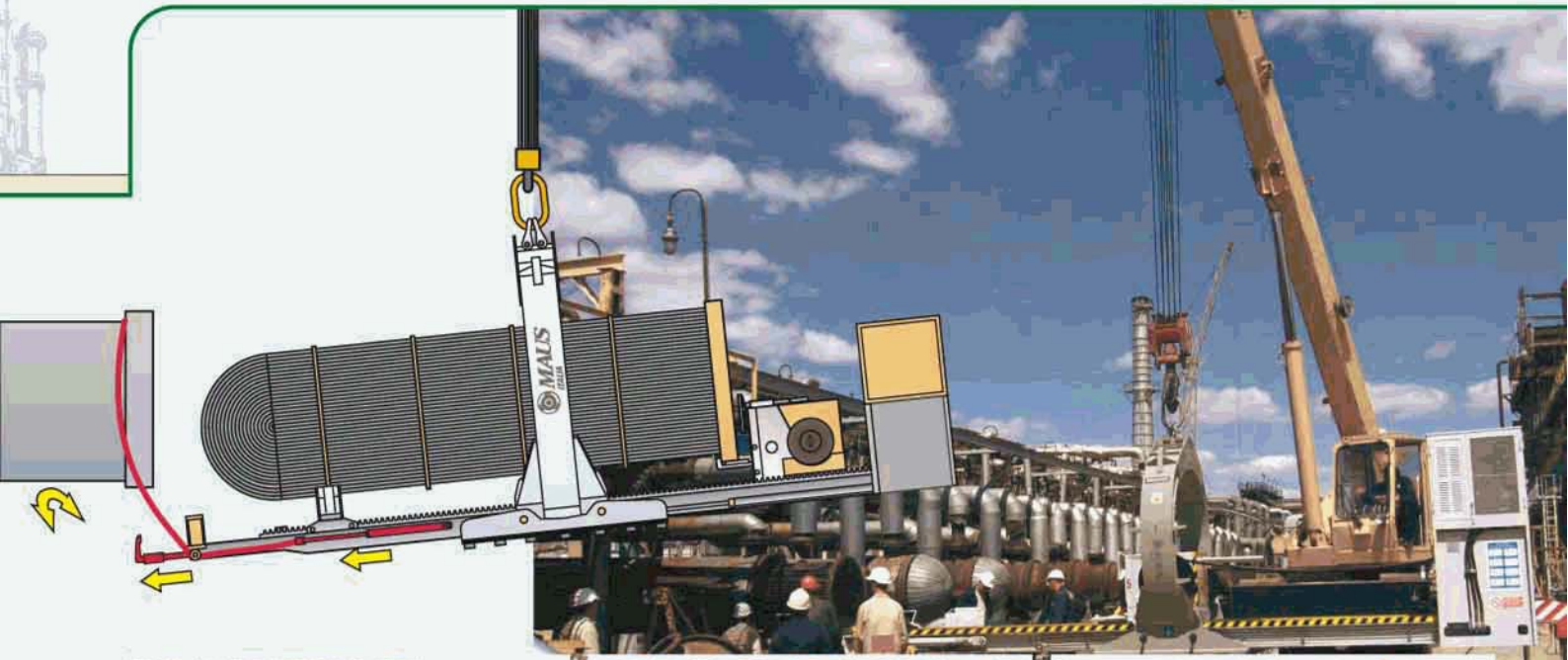


End of pulling
Balancing



Release
Shifting
Unloading





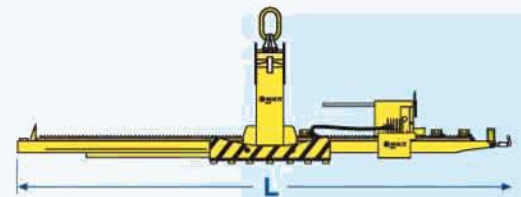
Aerial bundle extractors (off-shore)

Mef express NAVY

Quick hooking tube bundle puller



This special version of the **Mef express** unit has been produced to meet the need for extraction of tube bundles on petroleum platforms and installations at sea on large vessels known as FPSO. The machine consists of a **Mef express NAVY** operative part, produced for this purpose following the most rigid standards concerning shipbuilding. There are many similarities with the **Mef express ON SHORE** as a rapid extraction system, however it is equipped with a special device that blocks any oscillations of the bundle due to sea swell. It is very compact and light, suitable for handling in **small spaces**, powered by a mobile power unit called **Van Motor NAVY**. In view of the unusual nature of the off-shore application, the dimensional details of the **Mef express NAVY** are based on the design specifications of the installation provided by the final client or engineer in charge of the project in a spirit of the closest collaboration.



Motorization

Bundle extractors can be supplied with **Diesel engines** or **air motors**. Motors executions suitable for hazardous classified working area are available on request (*complete with Atex conformity declaration*).

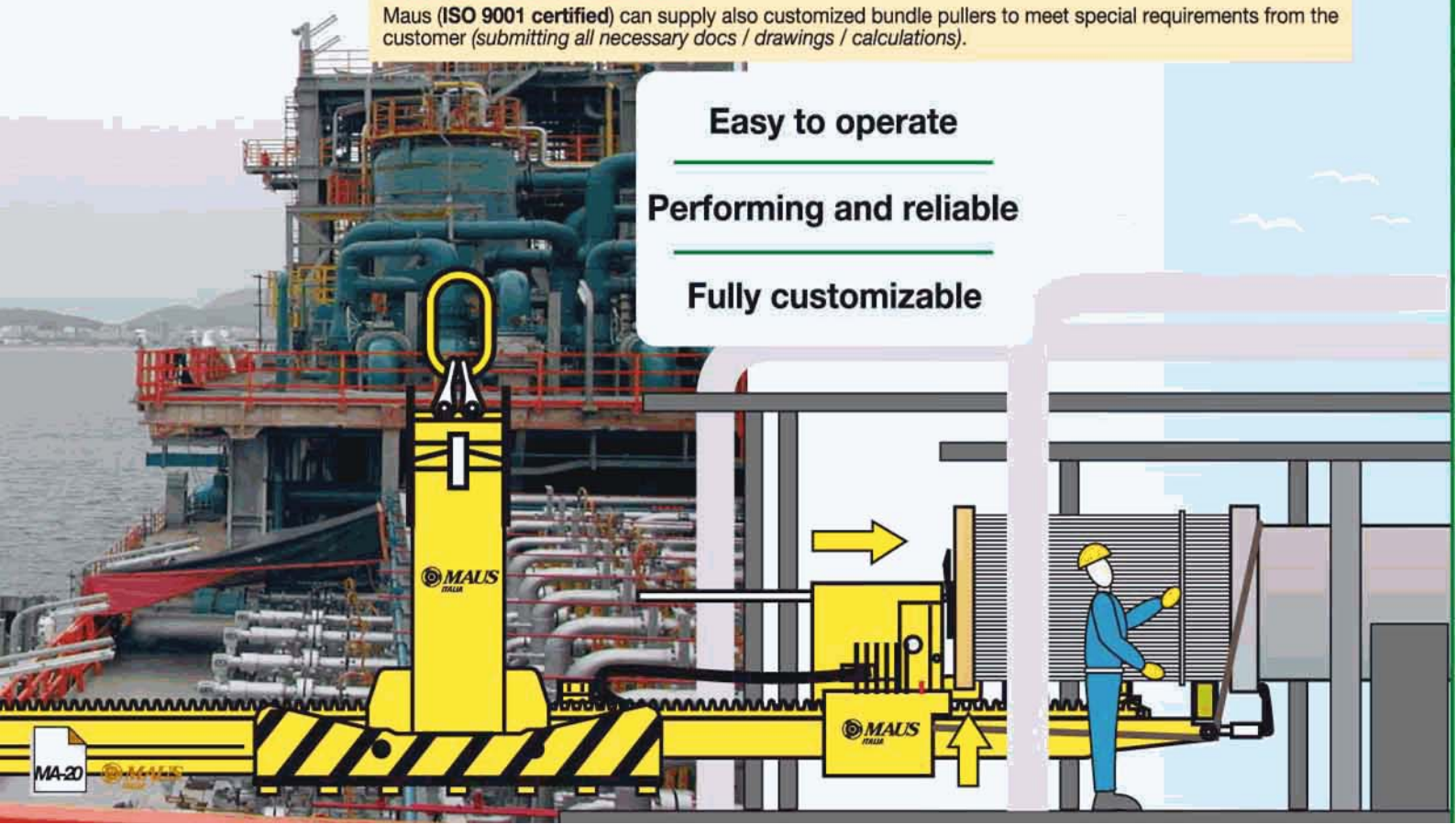
Customized executions

Maus (**ISO 9001 certified**) can supply also customized bundle pullers to meet special requirements from the customer (*submitting all necessary docs / drawings / calculations*).

Easy to operate

Performing and reliable

Fully customizable



Hydraulic commands



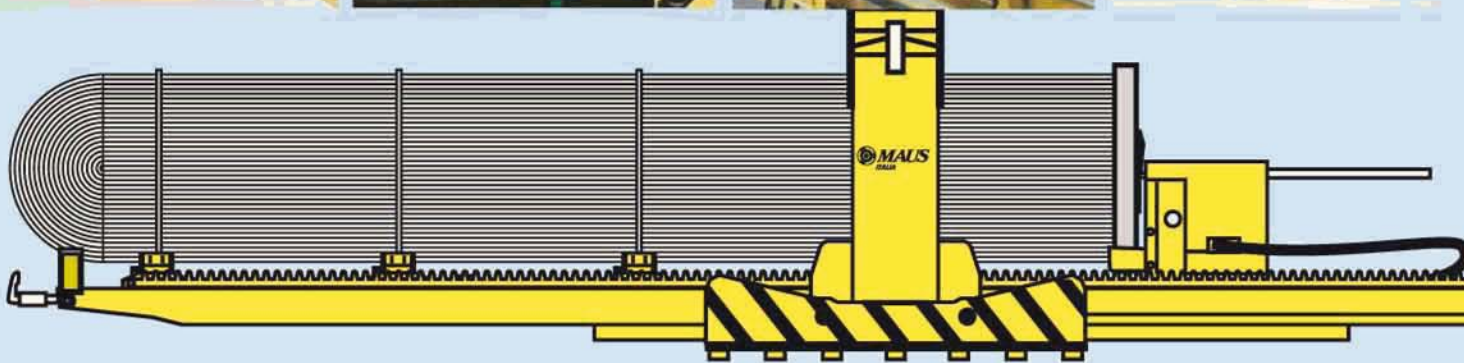
Main carriage with bundle blocking system



Circular rocker arm for lifting



Hydraulic vice



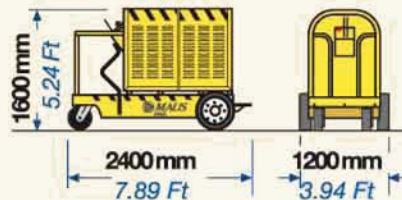
Van Motor NAVY

The separate drive unit complete with motor and hydraulic unit



Van Motor NAVY is a self-propelled trolley consisting of a hydraulic unit powered by a diesel motor converted into an **explosion proof version**. The hydraulic unit is connected to hydraulic hoses, wound on reels, which power the operative machinery.

With the **Van Motor NAVY** it is possible to operate both the **Mef espress NAVY** and the **Mef mobil NAVY**. This system reduces the weights and dimensions of the operating machines making it possible to access points in the plant that would otherwise be inaccessible. These machines are designed to be able to work in force 10 sea conditions.



Sturdy

High safety

Complete **trasformation** of the Diesel I.C.E., electrical, starter, battery and relevant control panel (close to the motor) according to:

- ATEX 94/9/CE (DPR n.126 of 28.03.1998) relative to machines and equipments used in dangerous area ZONE 2 Cat. 3G IIB T3 200°C (392°F)
- ENI1834-1 relative to the "Safety requirements" for designing and construction of I.C.E. to be used in atmosphere explosive.

Certification: **Explosion proof CE** declaration will be released according to the specification mentioned in the **ATEX 94/9/CE** for the 3G Category transformation.

Technical Specifications

- Trolley with two front driving wheels c/w self braking system and two rear self braking wheels.
- Footboard for driver
- Water cooled diesel motor model Lombardini LDW 2204, 35,5 Kw at 3000 rpm complete with spark arrestor
- Oil tank 200 Lt (53 US Gal) capacity
- Quick hydraulic connection
- Winding wheels for hydraulic hoses
- Electrical control panel for I.C.E control only for safe area operation
- Estimated weight: 750 Kg (1653 Lb)

Self propelled bundle extractors (on-shore)

Mef mobil

Self-positioning tube bundle puller, remote controlled for extraction, hoisting and movement of tube bundles



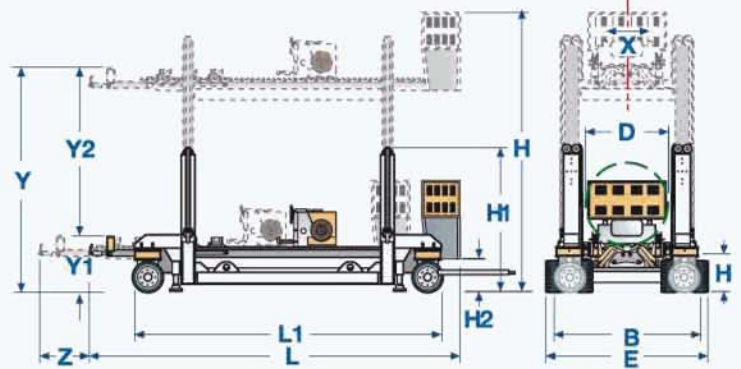
The **Mef mobil** tube bundle puller, designed for cases of difficult access, is completely **self-sufficient**, as is presented as a global solution in petrochemical plants for the extraction of tube bundles.

The tested rapid quick-hooking system **Mef express** is used for the **extraction and insertion** of the bundle.

The **Mef mobil** puller operates autonomously without the assistance of a crane for positioning and hoisting or trucks for transport to the tube bundle maintenance area after extraction.

It is solid, robust and stable and autonomously raises to a height of **4,2 m (166")** enabling a rapid and precise approach to the heat exchanger.

The use of the portable remote control (*wireless also available*), can control all the operations, leading to the inevitable reduction in personnel and increasing the final safety margins. The **Mef mobil** puller is proposed in two sizes, differentiating in weight, length and diameter of the tube bundle to pull out. The operation of inserting the tube bundle after maintenance also becomes extremely rapid and precise thus guaranteeing reduction in plant stopping times.



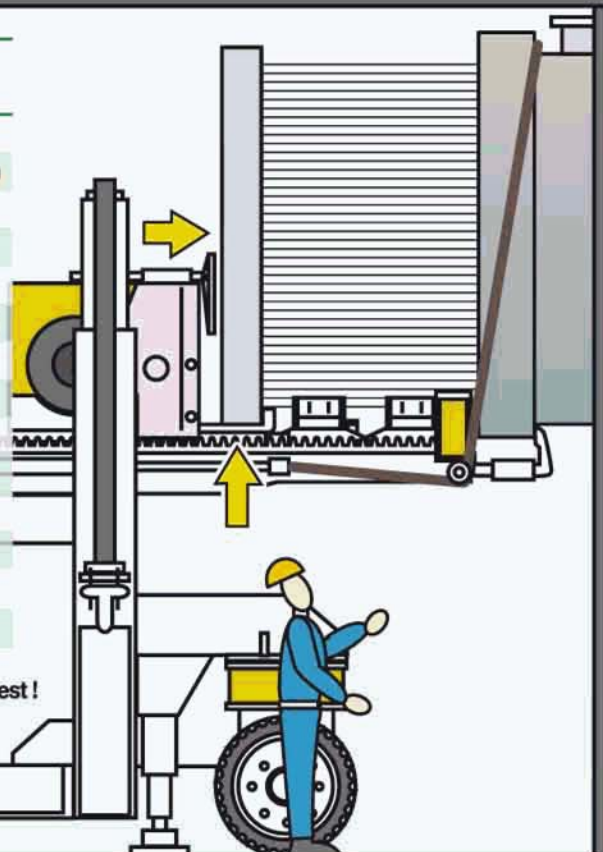
Easy to operate

Performing reliable

Performing reliable

Mef mobil		1300 65/75	2000 65/75
Min. width (transport)	B mm "	2500 (99)	3000 (119)
Max. length	L mm "	8100/9100 (319/359)	8100/9100 (319/359)
Height	H1 mm "	2540 (100)	2540 (100)
Plane height	H2 mm "	400 (16)	400 (16)
Min. heat exchanger height	Y1 mm "	650 (26)	700 (28)
Length excluding steering bar	L1 mm "	5050/6050 (199/238)	5050/6050 (199/238)
Max. width	E mm "	2900 (115)	3450 (136)
Max. height	H mm "	5850 (230)	5850 (230)
Feeding	Z mm "	1500 (60)	1500 (60)
Vertical stroke	Y2 mm "	3500 (138)	3500 (138)
Puller traverse	X mm "	±200 (± 8)	±100 (± 4)
Weight	Kg Lb	9200 (20300)	12500 (27600)
Axis rotation	DGS	120°	120°
Elevation at tube sheet bottom	Y* mm "	650/4150 (26/164)	700/4200 (28/166)

*Y = Y1 + Y2 ESpecial executions with Y2 > 3500mm (138") on request !



**Motor group
Hydraulic unit
Electric system**

**Support hydraulic
trolley and heat
exchanger
blocking system**

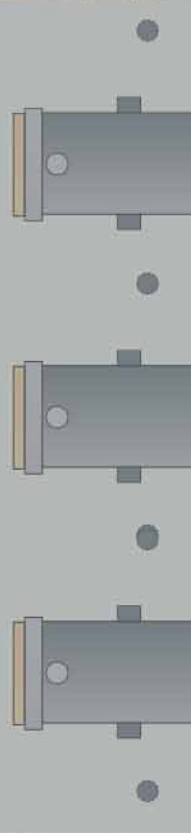
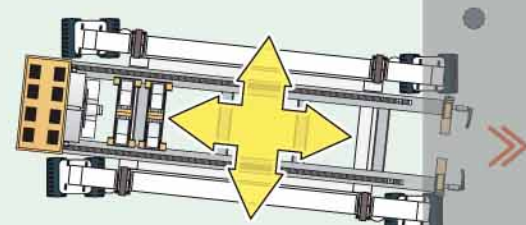
Driving seat

**Front view of
the bundle
extraction with
bundle support
trolley and
hydraulic vice**



Bundle size		1300 65/75	2000 65/75
Length	mm "	6500/7500 (255/295)	6500/7500 (255/295)
Diameter D	mm "	1300 (52)	2000 (79)
Max lifting capacity	T Lb	15 (33000)	30 (66000)

Performances		1300 65/75	2000 65/75
Main carriage pulling/pushing	KN Lb	30 (66100)	50 (110200)
Main carriage speed	m/min ft/min	2 (6.6)	2 (6.6)



Self propelled bundle extractors (on-shore)

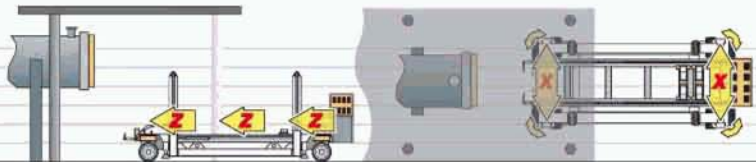
Mef mobil

Extraction sequence

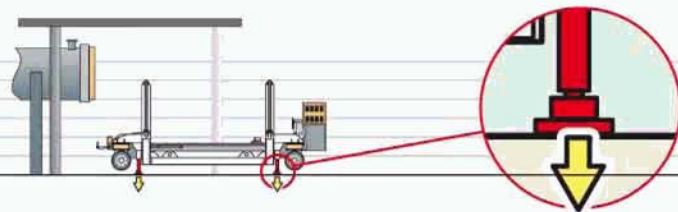
The main operations are shown below in sequence.



- 1 Approximate approach to about 0,5mt (20")



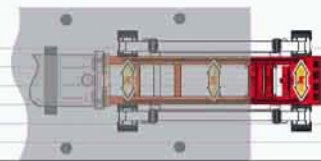
- 2 4 hydraulic feet to stabilize the puller



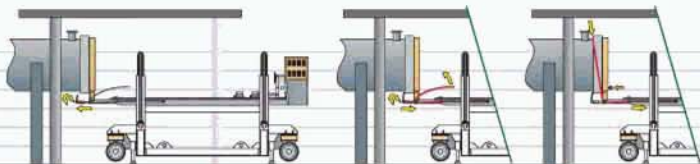
- 3 Servo-assisted positioning and hoisting upto
Y max = 4200mm (165")
Z max = 1500mm (59")



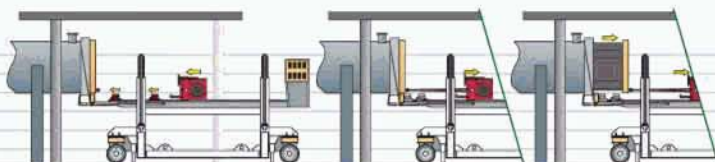
- 4 Servo-assisted positioning up to X max = 200mm (8")

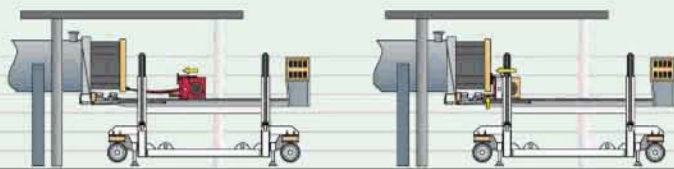
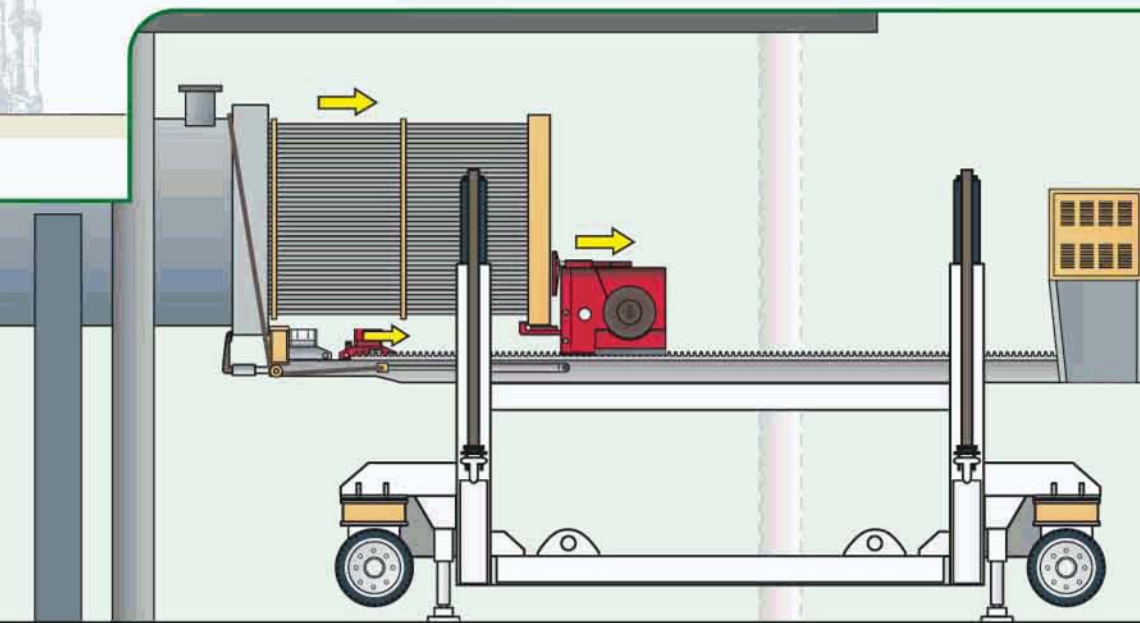


- 5 Shell blocking

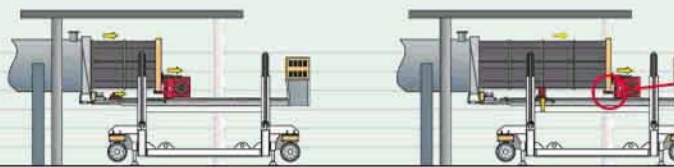


- 6 Trolley feeding
Fastening to eyebolts
Pull with cable

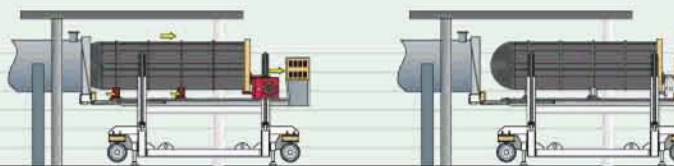




Trolley re-approach
with cable release
Hooking up for extraction
and support **7**



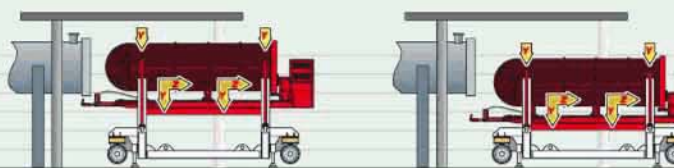
Pulling and support
with independent
hydraulically
controlled trolleys **8**



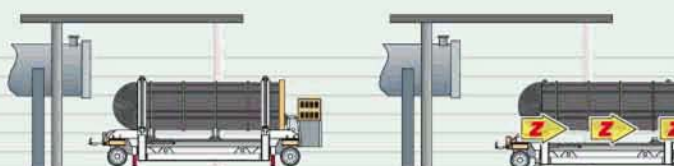
End of pulling **9**



Shell release **10**



Lowering of bundle **11**



Release of
4 hydraulic feet **12**
Towards the
maintenance area

Self propelled bundle extractors (off-shore)

Mef mobil NAVY

Self-positioning Puller, remote controlled for extraction, hoisting and movement of tube bundles

This special version of the **Mef mobil** unit has been produced to meet the need for extraction of tube bundles on petroleum platforms and installations at sea on large vessels known as FPSO. The machine consists of a **Mef mobil NAVY** operative part, produced for this purpose following the most rigid standards concerning shipbuilding. There are many similarities with the **Mef mobil ON SHORE** as a rapid extraction system, however it is equipped with a special device that blocks any oscillations of the bundle due to sea swell. It is very compact and light, suitable for handling in **small spaces**, powered by a mobile power unit called **Van Motor NAVY**.

In view of the unusual nature of the **off-shore application**, the dimensional details of the **Mef mobil NAVY** are based on the design specifications of the installation provided by the final client or engineer in charge of the project in a spirit of the closest collaboration.



Easy to operate

Performing and reliable

Customized design

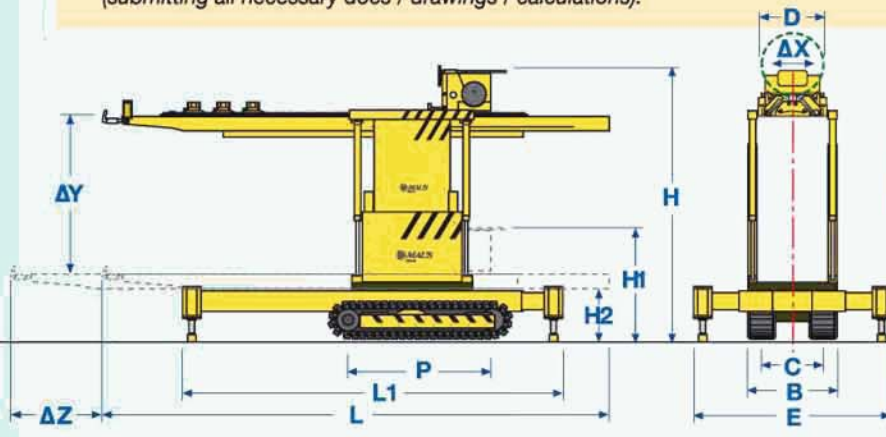
Self-positioning

Motorization

Bundle extractors can be supplied with **Diesel engines** or **air motors**. Motors executions suitable for hazzardous classified working area are available on request (*complete with ATEX conformity declaration*).

Customized executions

Maus (ISO 9001 certified) can supply also customized bundle pullers to meet special requirments from the customer (*submitting all necessary docs / drawings / calculations*).





Hydraulic control



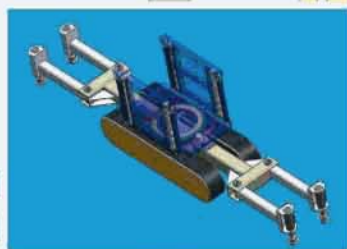
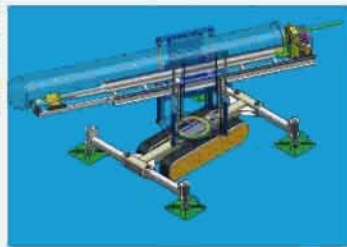
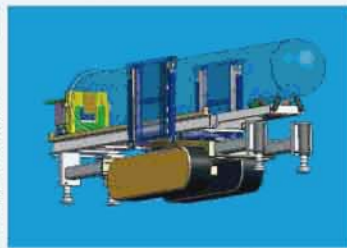
Blocking system to the heat exchangers



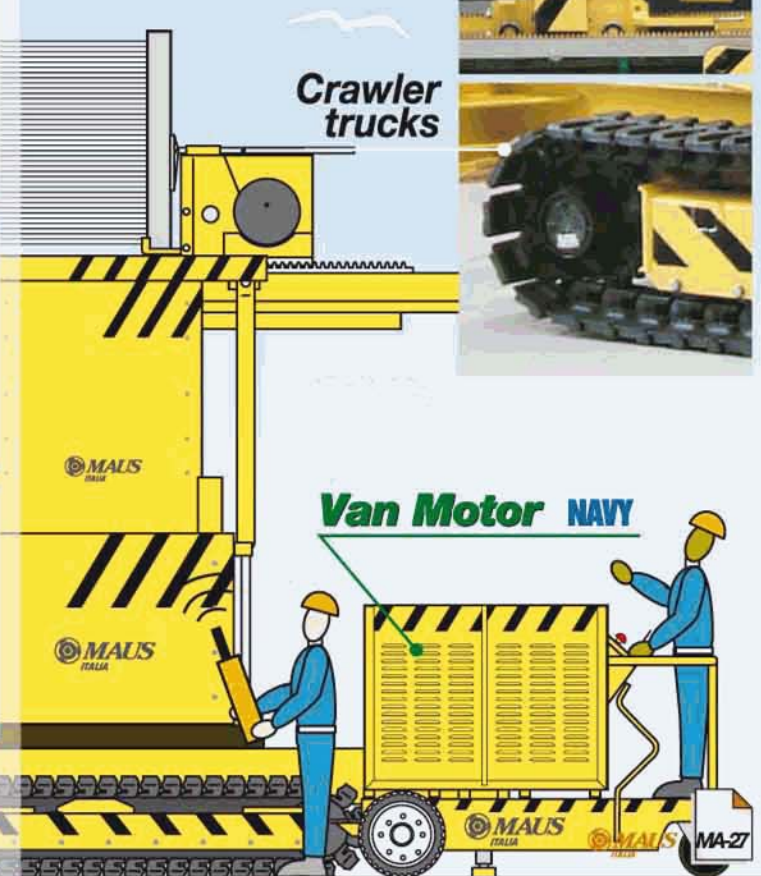
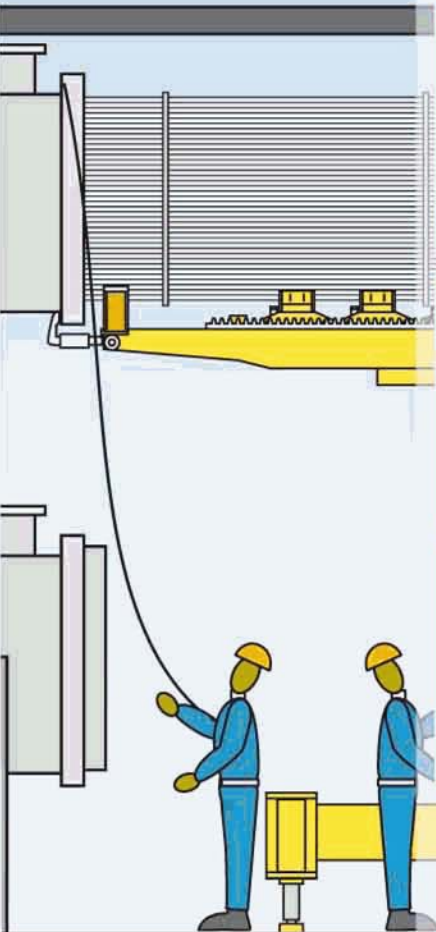
Main carriage



Advanced design



Crawler trucks



Van Motor NAVY

Truck mounted tube bundle puller

Mef truck

Completely independent tube bundle puller assembled on the truck



Mef truck, thanks to the original project of the telescopic rotating column, allows the quick pulling/inserting of the bundle.

Once the truck is positioned, it is easy and **quick to lift** the extractor and to proceed with the extraction.

This system is particularly advised for the maintenance companies which operate continuously in the petrochemical plant field



NO TOW TRUCK

- Quick pulling**
- Performing and reliable**
- Self propelled**
- completely independent**



Dual-Use trolley
Capacity of pulling
on both sides



Main features

Mef truck positioning

Hydraulic stabilizers

Oleodynamic structure with 6 telescopic independent arms

Rotating telescopic column

Complete lifting system assembled on thrust bearing and having a lifting stroke of 6400mm (21 Ft); 600 ÷ 7000 mm (2÷23 Ft). 90° column rotation is permitting the positioning of the extractor on the same axis of the bundle (*working position*)

Extractor frame

The extractor frame is assembled on the lifting fork and it is longitudinally moved by two double effect hydraulic cylinders.

Pulling/pushing

Manual trolleys

They grant a safe support during the extraction/insertion of the bundle.

Pulling/pushing trolley

Bundle extraction on both truck sides thanks to the frame design and especially thanks to the main carriage (complete with anchoring plate on both sides) design with capacity of pulling/pushing on both sides.

Control

Proportional remote control

Control on working operations by radio remote control wireless system.

Manual commands

Emergency push buttons command.



Dual-Use trolley pulling / pushing



Lifting/anchoring plate



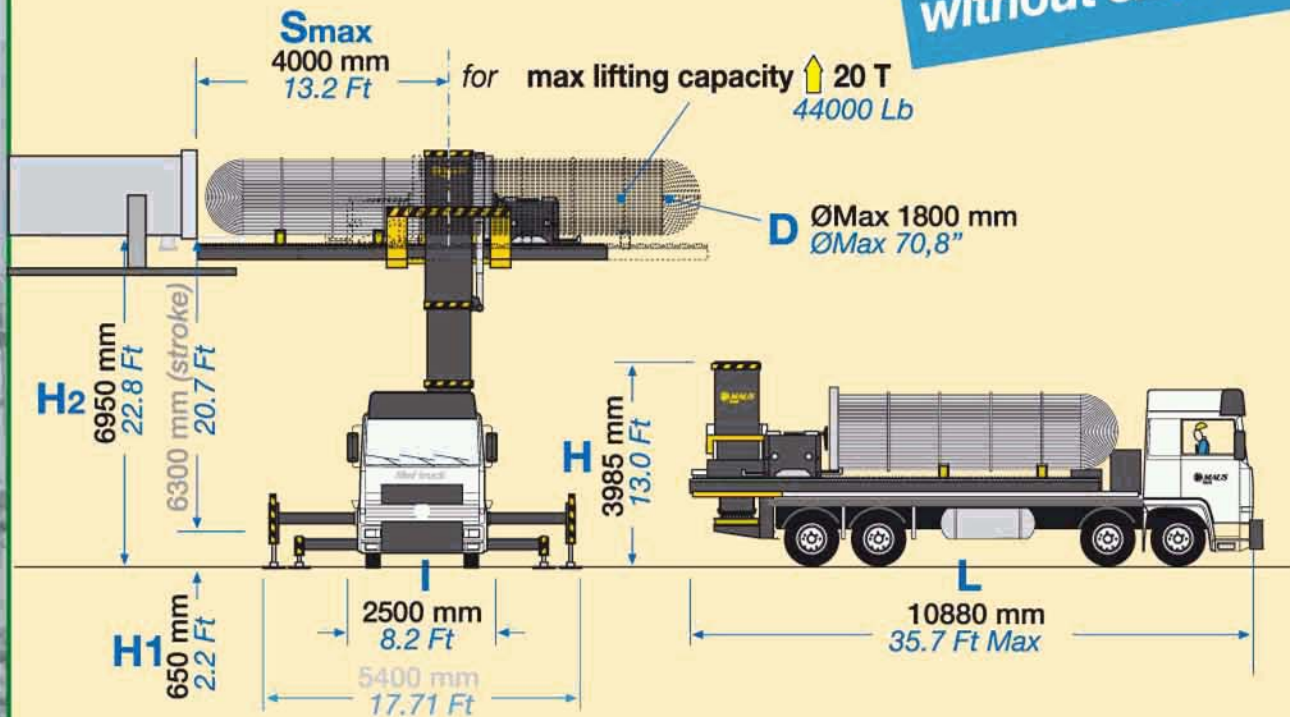
Truck mounted tube bundle puller

Mef truck



Technical features

Fast extraction
without shell hooking



Bundles dimensions and max weight

		1800 75	
Tube sheet O.D.	D mm	1800	70.8
Length	mm Ft	7500	24.6
Max lifting capacity ↑	T Lb	20	44000

Overall dimensions and weight

		1800 75	
* Truck width	I mm Ft	2500	8.2
* Height	H mm Ft	3985	13.0
* Length	L mm Ft	10880	35.7
Weight	Kg Lb	32900	72500

Performances/working capacities

		1800 75	
** Ledge	S_{max} mm Ft	4000	13.2
** Bundle elev. (min/max)	H₁/H₂ mm Ft	650/6950	72550
Pulling max speed	m/min Ft/min	2	6.6
Pulling/pushing force ←	T Lb	40	88000

Mef truck
is supplied with:

• VOLVO FM13 360 8x4

Class

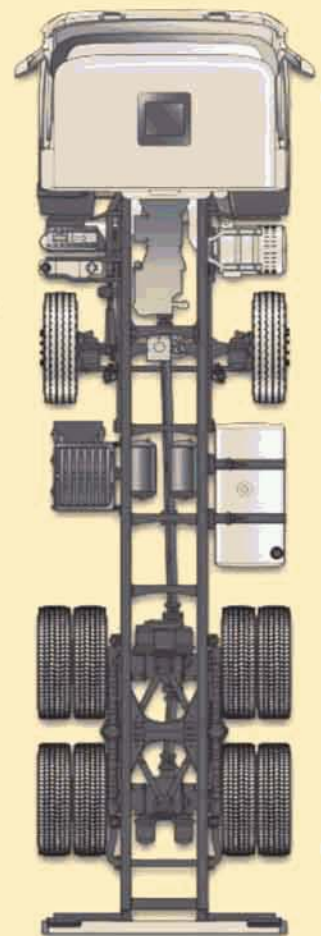
EURO 4 (standard)
EURO 5 (optional)

Engine

D13B 13 litre
inline 6 cylinder
turbo charged
intercooler diesel

Max power

360 HP (270KW)
at 1400-1800 rpm

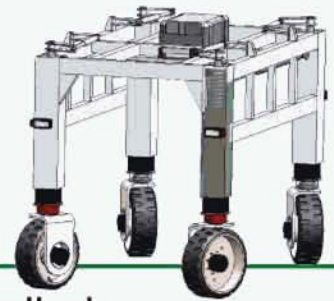


* With extractor closed on the truck

** As to truck axis (measure of working position)

** Measuring at the tube sheet bottom

Bundle transporter



Mammut

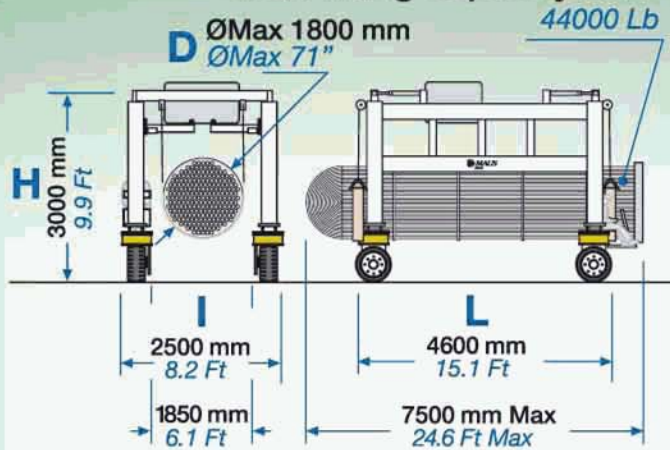
On-site self-propelled heat-exchanger transporter

This specially designed machine provides a brilliant solution to the problem of **moving tube bundles inside the plant** from the point where they are extracted to the **washing yard** or the internal workshop of the plant thus eliminating the use of trucks and mobile cranes and speeding up considerably the loading and unloading operations carried out just a few inches from ground level in **complete safety**.



- Sturdy**
- Less personnel**
- High driveability**
- High level of safety**

max lifting capacity 20 T



Bundles dimensions and max weight			1800 75	
Tube sheet O.D.	D	mm	1800	71.0
Length		mm Ft	7500	24.6
★ Max lifting capacity		T Lb	20	44000

Overall dimensions and weight			1800 75	
Width	I	mm Ft	2500	8.2
Height	H	mm Ft	3000	9.9
Length	L	mm Ft	4600	15.1
Weight		Kg Lb	5000	11000

Performances/working capacities			1800 75	
Max speed (No load)	Kmh Mph		30	19
Max speed (Full load)	Kmh Mph		16	10
Max gradient			10%	

Motorization		1800 75	
Motor type: diesel		Lombardini LDW 2204 T	
Cylinders	N°	4	
Displacement	cc	2199	
Boring	mm "	88	3.46
Stroke	mm "	90	3.56
Rpm		3000	
Power	Kw	49.2	
Maximum Torque	Kg/m Lb/Ft	18,7	135
Oil capacity	Lt US Gal	4,50	1.19

★ Also available on request for 40 T (88000 Lb)

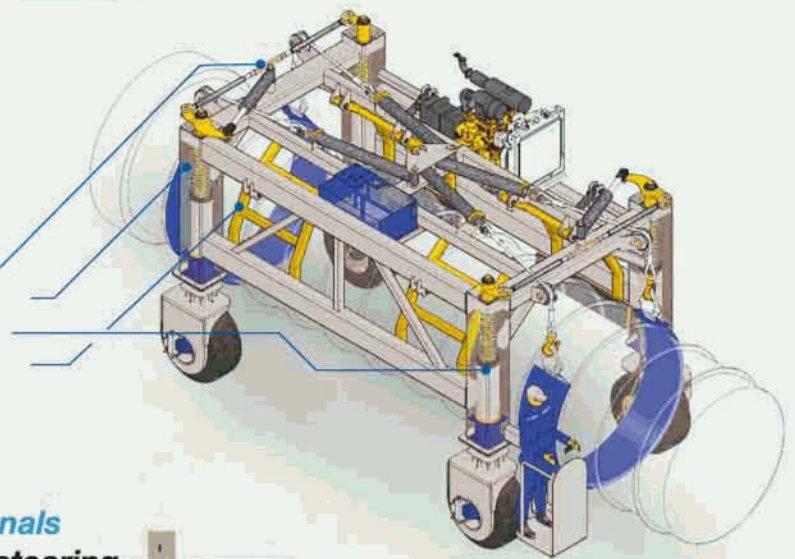
Mammut

Standard supply

- Lifting brackets
- Standing driving place
- Two steering driving wheels

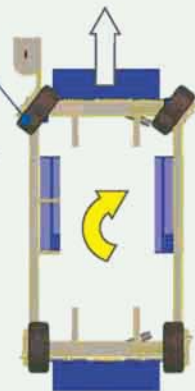
Optionals supply

- Rear steering
- Damping system of rear wheels
- Damping system of front wheels
- Bundle clamping jaws
- Driving seat
- Portable radiocommand



Two steering driving wheels

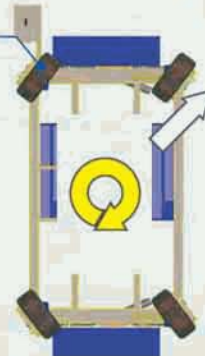
Standard supply for base execution.



Optionals

Four steering driving wheels

Full steering allows a lower ray with quicker movements. Moreover, it is possible to move transversally, very effective during the positioning.



Optionals

Anti-oscillation hydraulic vices

Bundle locking for eliminating the oscillation during the transport, allowing a safety and rapid movement.



Double portal frame

Designed in accordance with Class FEM A3 of the European Movement Federation and in respect of CE 98/33 rules.

Hydraulic lifting

The synchronization of hydraulic cylinders movement in combination with the ropes of transmission is controlled by manual levers at the driving seat.

Superelastic tyres

They reduce sensibly the noise, the vibrations, the deformations in full-load and the rolling friction with consequent fuel reduction. Extremely cut resistant for a nearly nul maintenance.

Optionals

Four driving wheels, obtained with hydraulic motors of self-bracking type directly flanged and integrated on them

Damping system, allowing the tyre having always grip on the ground

Particularly indicated for disconnected grounds

