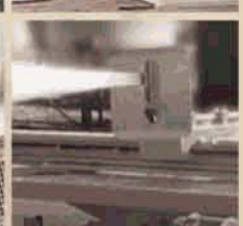




## Tube bundle cleaning

After extraction the tube bundle is taken to the **area where the high pressure water washing equipment is located**. Maus Italia has a complete range of machines for **automatic internal and external cleaning of the tubes** in the tube bundles.

These machines are indispensable for cleaning exchangers on an industrial scale. The **simultaneous use of a number of high pressure water jets** ensures that the cleaning is **rapid and thorough**.

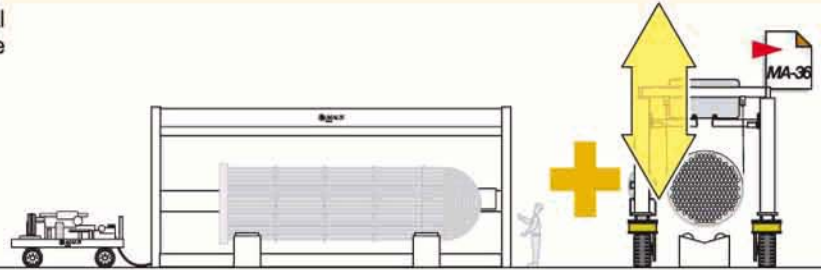


## BCL-X + Idroscal + Mammut

**Robot for the external automatic cleaning of tube bundles.**

These machines, produced in electrowelded steel, automatically washes the outside of the tube bundle, which is placed on motorized rollers, and disintegrate encrusted scale with powerful jets of water.

Together with the powerful pump of the **Idroscal 350** or **Idroscal 400** series, this is the equipment needed to deal with bundles one after another during plant maintenance shutdowns.

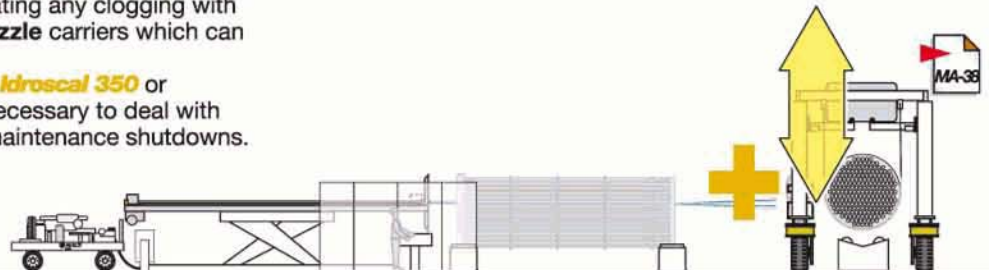


## BCL-IN+ Idroscal + Mammut

**Robot for the internal automatic cleaning of tube bundles.**

These machines, produced in electrowelded steel, automatically washes the inside of the tube, disintegrating any clogging with powerful jets of water applied by 4-6 nozzle carriers which can move simultaneously on 3 axes.

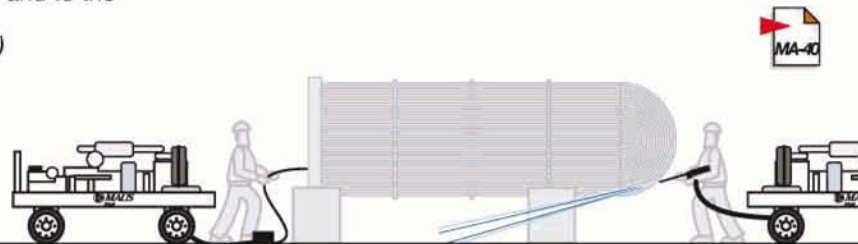
Together with the powerful pump of the **Idroscal 350** or **Idroscal 400** series, this equipment is necessary to deal with bundles one after another during plant maintenance shutdowns.



## Idroscal-pump

**Hydrodynamic pump for the external/internal manual cleaning with high pressure**

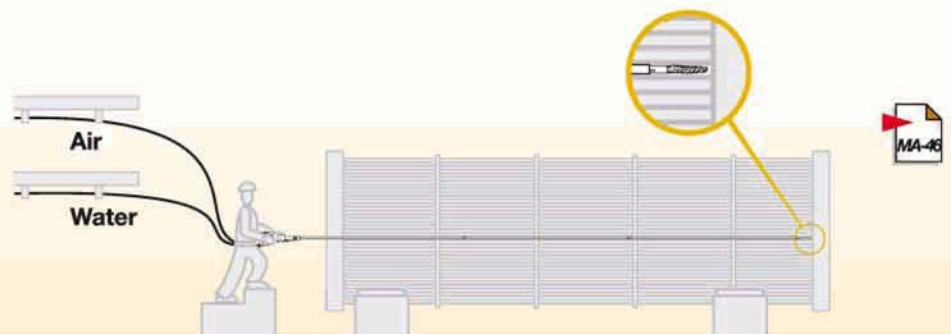
Indispensable element for the heat exchangers cleaning. Maus Italia suggests different sizes according to the use and to the requested services, necessary to grant scale removal. Indicatively, **Idroscal 110** (with installed power 110 Kw) offers a service range which is normally enough for solving more frequent problems.



## Hardscal

**Pneumatic shafting tube cleaners for heat-exchangers tubes**

The pneumatic shafting tube cleaners with tool water cooling system are the simplest and most effective solution for cleaning the heat exchanger tubes, even when completely clogged.





**STD execution for bundles up to**  
 1600x8000x25TonMax 63"x315"x55000LbMax  
mm mm

# High Pressure external cleaning robot

## BCL-X

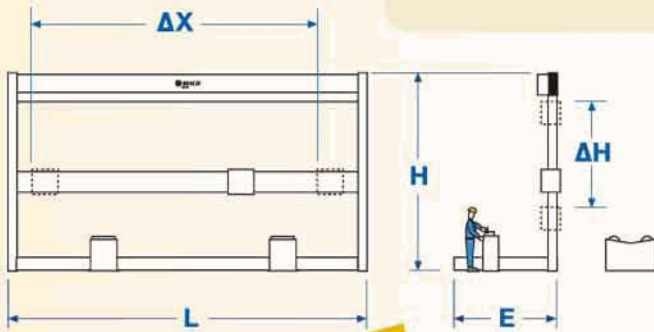
### Automatic high Pressure external cleaning robot

This equipment automatically washes the tube bundle which is placed on motorized rollers, disintegrating the scale with powerful jets of water which are moved longitudinally and sideways through the tube bundle. Together with a powerful modern pump of the **Idroscaal** series with incorporated speed reducer, this is the equipment needed to deal with bundles one after another during plant maintenance shutdowns. Designed and developed for high technology cleaning of exchangers. The general features and size of the **BCL-X**, apart from the standard model presented, are based on the specific engineering situation.



**Easy to use**  
 Safe and **reliable**  
**Minimum maintenance**  
 Carrier box motion

**Hydraulic pack distributor**  
 controlling 3 movements.  
**STD supply EEX Electric motor;**  
**Diesel driving units on request**



### Support rollers for heat exchangers

Set of rollers: 1 motorized roller and 1 idle.



### BCL-X Heavy duty L-shape frame

Parameter	Symbol	Unit	Value	Value
Length	L	mm Ft	8500	28.0
Horizontal stroke	ΔX	mm Ft	8000	26.2
Height	H	mm Ft	2310	7.6
Vertical stroke	ΔH	mm Ft	1600	5.2
Width	E	mm Ft	2100	6.9
Weight		Kg Lb	2800	6200

### Rollers SET

			STD	On request
Weight	Kg Lb	800	1764	950 2094
Max lifting capacity	T Lb	30	66000	45 99000

### Customized executions

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







## Operating procedure

### Step 1

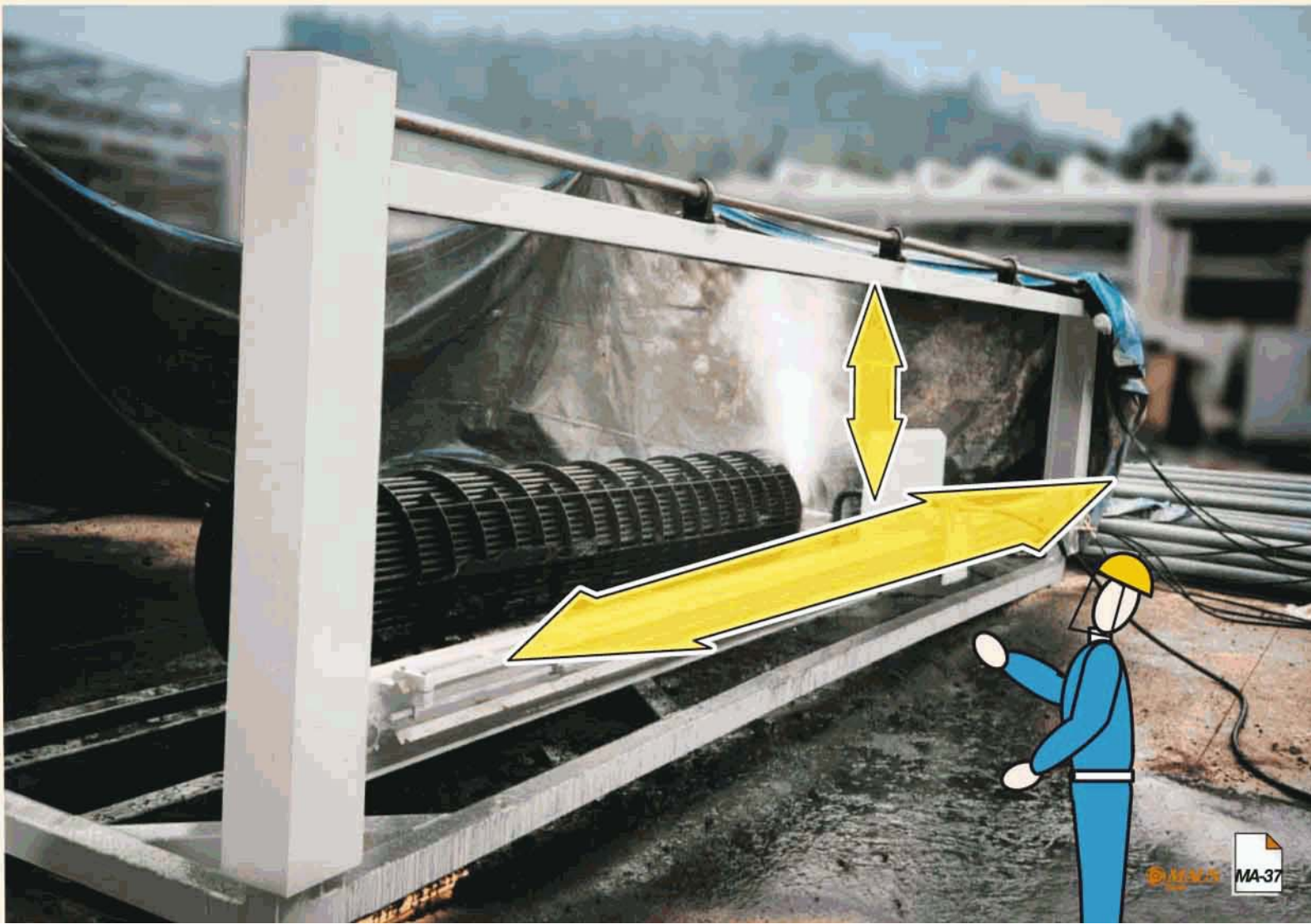
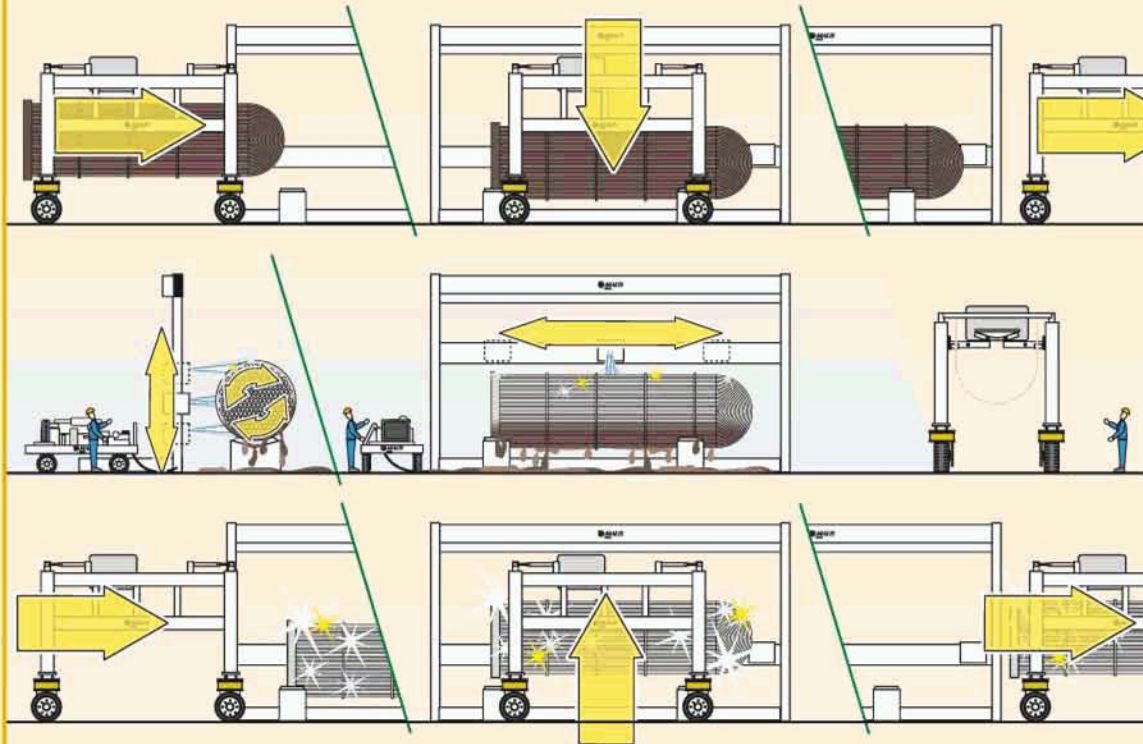
The tube bundle is positioned on the rollers in front of the **BCL-X** using the **Mammut** transporter.

### Step 2

The machine moves on the horizontal and vertical axes while the tube bundle is rotated by the motorized rollers enabling the water jets to disintegrate the scale.

### Step 3

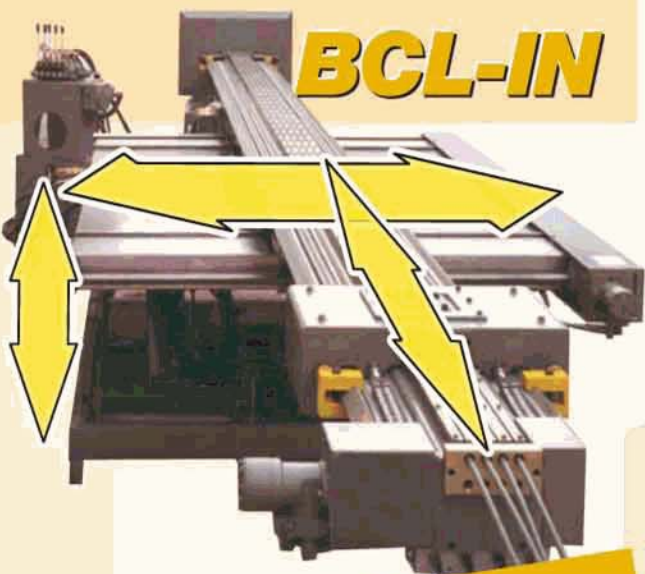
When the washing is finished the tube bundle is picked up again by the **Mammut** and taken back on site for insertion.





**Range of tubes**  
I.D. from 10 to 40mm (3/8" to 1.1/2")

# High Pressure internal cleaning robot



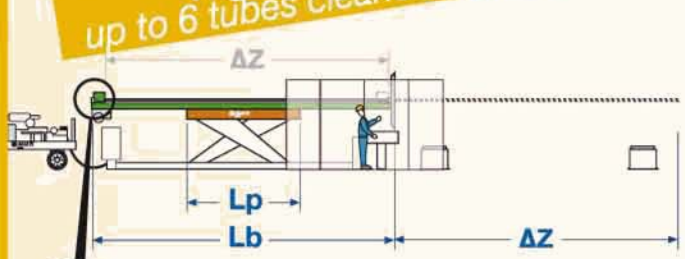
**BCL-IN**

Multiple nozzle carrier robot for the **automatic** internal cleaning of tube bundles

The robot **automatically washes** the tube bundle, lying on the motorized rollers, disintegrating encrusted scale with powerful jets of water brought inside the tubes by nozzle carriers. Together with a powerful modern pump of the **Idroscal** series with incorporated speed reducer, this is the equipment needed to deal with bundles one after another during plant maintenance shutdowns. Designed and developed for high technology cleaning of exchangers. The general features and size of the **BCL-IN**, apart from the standard model presented, are based on the specifications of the engineering department.

- Easy to use**
- Safe and reliable**
- Minimum maintenance**
- Adjustable** (tube length and pitch)
- Manual commands for robot cleaning on power pack**

**High performing**  
up to 6 tubes cleaned in 14sec.



**Variable number of rigid lances: 2 - 4 - 6**

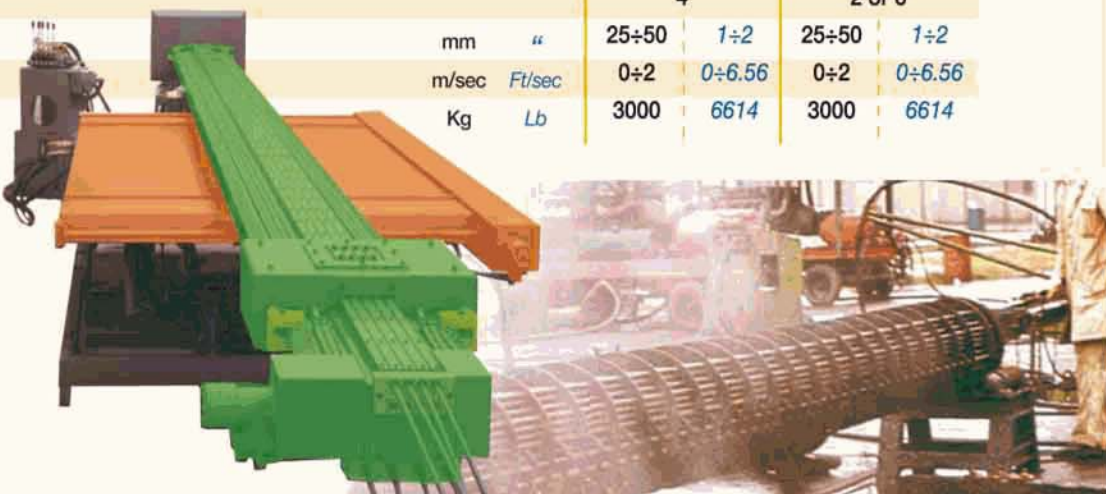
Support rollers for heat exchangers 

**STD execution for bundles up to**  
1600x7500x25Ton<sub>Max</sub> 63"x295"x55000L<sub>bMax</sub>

				STD		Optional	
Lances holder bean	Lances holder bean Length	<b>Lb</b>	mm Ft	8000	26.2	10500	34.4
	<b>Horizontal</b> Lances holder bean stroke	<b>ΔX</b>	mm Ft	1400	4.6	1400	4.6
	Lances holder bean Stroke (inside tubes)	<b>ΔZ</b>	mm Ft	7500	24.6	10000	32.8
platform	Lances Length		mm Ft	7500	24.6	10000	32.8
	Lifting platform Length	<b>Lp</b>	mm Ft	3000	9.9	3000	9.9
	Lifting platform width	<b>E</b>	mm Ft	1800	6.0	1800	6.0
	Lifting platform height (retracted: level min.)	<b>Hmin</b>	mm Ft	600	2.0	800	2.6
	Lifting platform height (extended: level Max.)	<b>H</b>	mm Ft	2200	7.2	3800	12.4
	Vertical platform stroke (level Max. - level min.)	<b>ΔH</b>	mm Ft	1600	5.2	3000	9.8
	Number of rigid lances				4		2 or 6
Adjustable tubes pitch		mm "	25÷50	1÷2	25÷50	1÷2	
Main carriage speed		m/sec Ft/sec	0÷2	0÷6.56	0÷2	0÷6.56	
Weight (platform with beam)		Kg Lb	3000	6614	3000	6614	

**Customized executions**

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







## Operating procedure

### Step 1

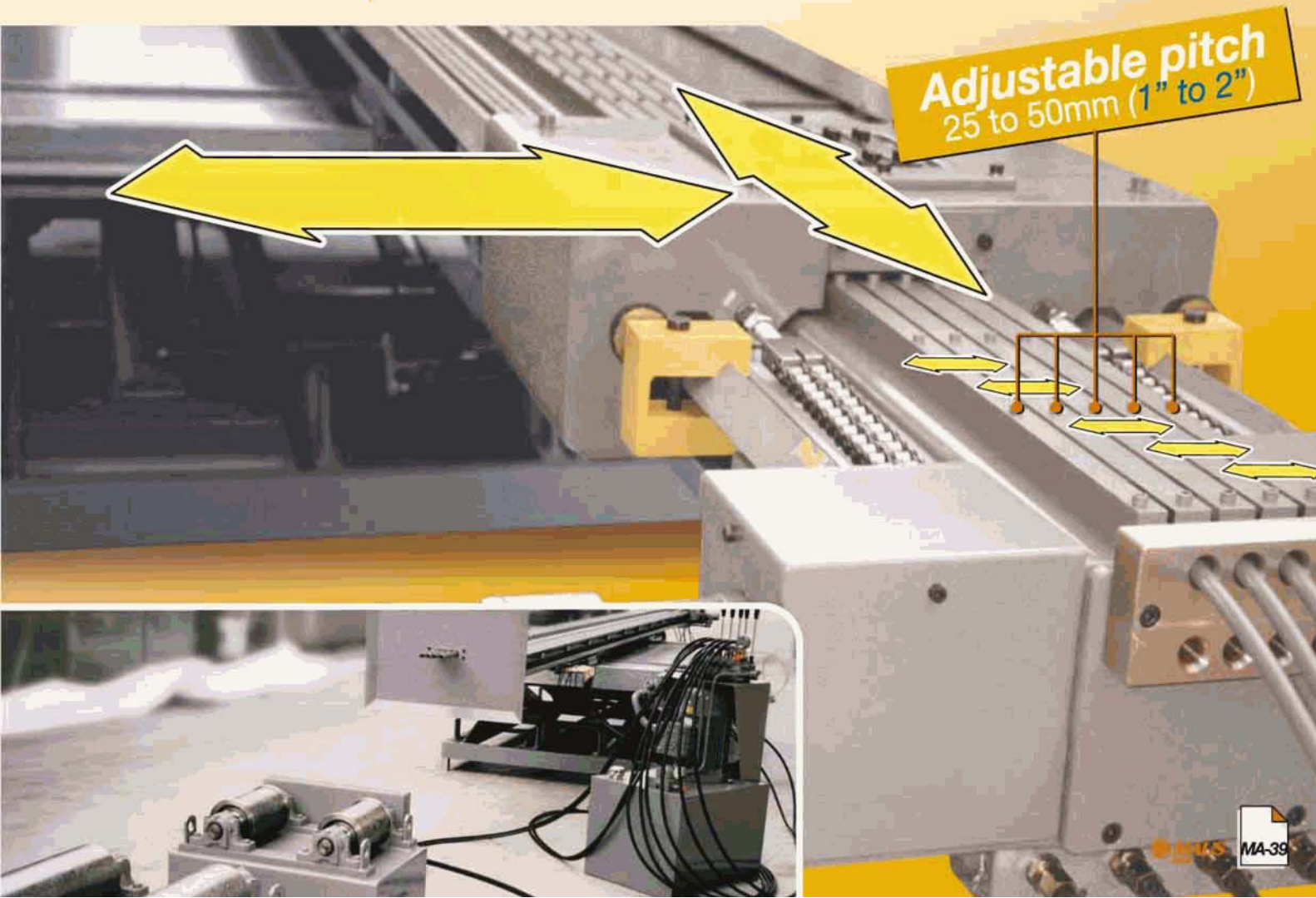
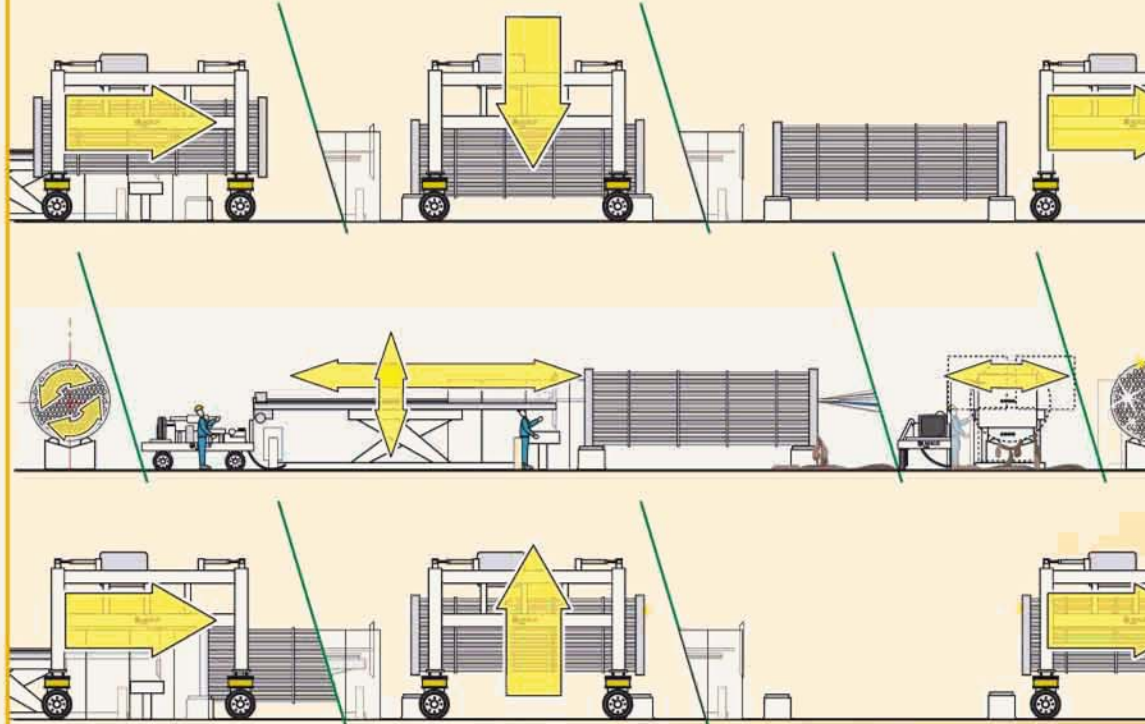
The tube bundle is positioned on the rollers in front of the **BCL-IN** using the **Mammut** transporter.

### Step 2

The rows of tubes to be cleaned are aligned with the row of nozzle carriers by the motorized rollers. Once the nozzle carriers have been positioned at the inlets of the tubes by the servo system they can be moved forward for descaling the tube interiors.

### Step 3

When the washing is finished the tube bundle is picked up again by the **Mammut** and taken back on site for insertion.



**Adjustable pitch**  
25 to 50mm (1" to 2")



# High Pressure internal/external manual cleaning pumps

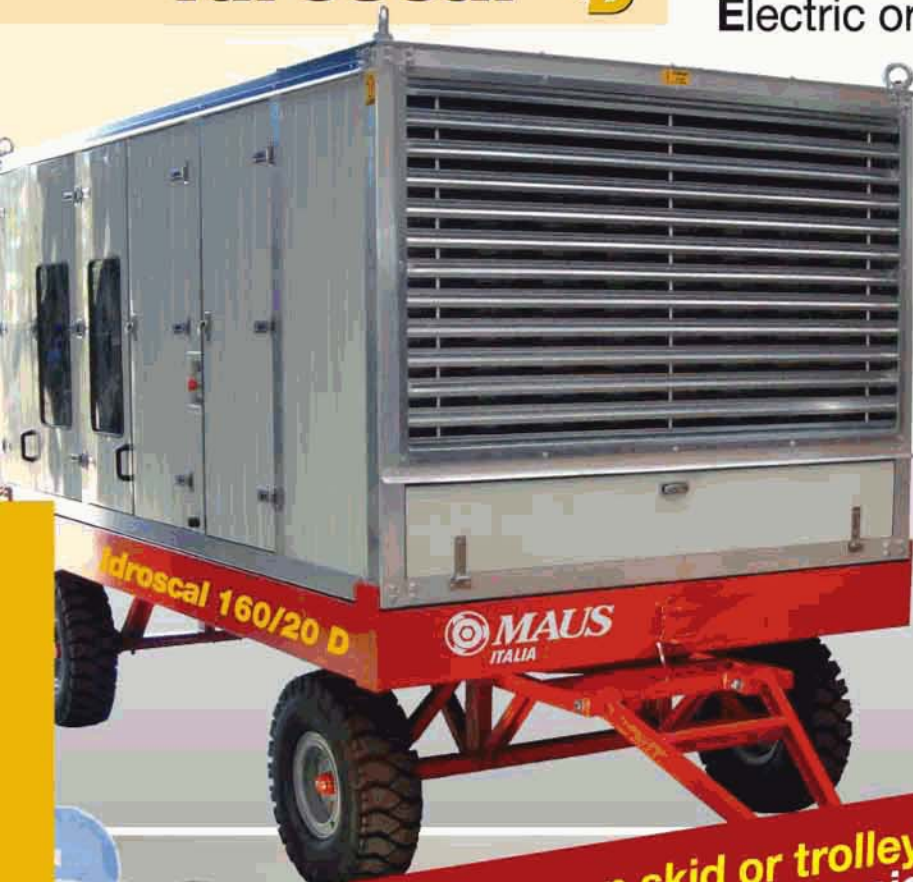
**Idroscal NAVY**

Idroscal pumps can be supplied on request in **NAVY** version with suitable motors for hazardous classified working area (complete with **Atex conformity** declaration)



**Idroscal** <math>\begin{matrix} E \\ D \end{matrix}</math>

Hydrodynamic pump descalers for heat-exchangers, with Electric or Diesel motor.



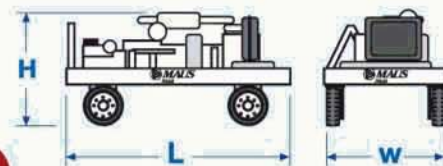
**Hydrodynamic descalers for heat exchangers** are an indispensable supplement to our already wide range of machines for working in the chemical industry, refineries and petrochemical plants.

Our units are supplied completely skid assembled (on-wheels on request) and are including the necessary safety devices and controls (on request) to guarantee the perfect running for a long working life.

The hydrodynamic units are basically including a reciprocating triplex plunger pump c/w piping and fittings, manometer, mechanical pressure gauge and safety valve; the assembling pumps-driving units is made with flexible joint adequately protected.

**Speed reducer incorporated**

**Stainless steel head**



**Available on skid or trolley  
and also soundproof version**





# Working accessories

## External tube cleaning

## Internal tube cleaning



### H.P. hose



Available in pieces of 20 mt (65.6 Ft). F/F joined 9,5 mm (3/8"), 22x1.5 mm (0.87"x 0.06), 19,0mm (3/4") with 2, 4 and 6 reinforcement braids in steel wire. In accordance with SAE and DIN standards.

### High pressure gun



With automatic valve and safety block in accordance with German standards. 1000 bar (14500 psi).

### Nozzle for high pressure gun



Made in INOX steel and in different shapes according to the job and the kind of scaling (Flat or round).

### Spare parts service



The piston pumps have a high performance and reliability, but need expert maintenance and original spare parts.

## Other nozzles

### Rotating nozzle



Nozzle with frontal rotating jet and protective cover. Max. pressure 500/1000 bar (7250/14500 psi)

### Revolving nozzle "gir-o-jet"



Self-blocking jets also with sapphire insert and jets in semi-radial position or combi.

### Nozzle with cutter



Available in various diameters for combining a mechanical effect with the hydrodynamic action.

### H.P. hose



Available in pieces of 20 mt (65.6 Ft). F/F joined 9,5 mm (3/8"), 22x1.5 mm (0.87"x 0.06), 19,0mm (3/4") with 2, 4 and 6 reinforcement braids in steel wire. In accordance with SAE and DIN standards.

### Foot valve



In INOX steel. It's necessary to the operator handling the lances for internal tubes cleaning.

### Flexible lances for tubes



Available size from O.D. 9,5mm (0.37"), up to O.D. 18mm (0.71"). Max. working pressure over 4350 bar (63000 psi).

### Nozzle for flexible lances



In INOX steel with rear jets. Position and number of jets upon request. Available sizes from O.D. 100mm (3.93").



# High Pressure internal and external manual cleaning pumps



## Idroscal

### Pumps main features and model choice examples

The selections of the right pump size is obtained by consulting the below table, where looking for the needed combinations of performance (capacity and pressure) is obtained the pump plungers diameter and the pump power; these to data define the selected pump as per given examples.

#### Pump model selection

Examples

- The model of one pump given 97 Lt/min (25.6 US.Gal/min) capacity with a pressure of 810 Bar (11750 psi) will be:

**Idroscal 160/28**

**E** Electric  
**D** Diesel

- Operating manual pistol for external washing requires 54 Lt/min (14.3 US.Gal/min) with a pressure of 785 Bar (11385 psi); the selected model will be:

**Idroscal 90/24**

**E** Electric  
**D** Diesel

## For BLC

Pumps	Cod.	mm	45 Kw		90 Kw		110 Kw		130 Kw		160 Kw		350 Kw		400 Kw	
			Debit	Pressure	Debit	Pressure	Debit	Pressure	Debit	Pressure	Debit	Pressure	Debit	Pressure	Debit	Pressure
	14	14	15	1530	18	2300	-	-	-	-	-	-	-	-	-	-
	16	16	20	1170	24	2000	-	-	-	-	-	-	-	-	-	-
	18	18	25	940	30	1395	35	1630	38	1750	40	2000	-	-	-	-
	20	20	31	760	37	1130	43	1305	47	1430	49	1600	-	-	-	-
	22	22	37	630	45	930	52	1075	57	1180	59	1300	-	-	-	-
	24	24	44	530	54	785	62	905	68	995	71	1100	-	-	-	-
	26	26	52	450	63	665	73	770	79	845	83	950	98	1880	98	2000
	28	28	60	390	73	575	84	665	92	730	97	810	114	1620	114	1820
	30	30	69	340	84	500	97	560	106	635	111	710	131	1440	131	1580
	32	32	78	295	96	440	110	505	120	560	126	620	149	1265	149	1400
	36	36	99	235	121	345	139	400	152	440	160	490	188	1000	188	1100
	40	40	122	190	150	4061	172	325	188	355	197	400	232	810	232	900
	45	45	155	150	190	280	218	255	238	280	250	315	294	640	294	705
	50	50	191	120	234	180	269	205	294	225	309	255	363	505	363	560
	55	55	232	100	283	150	326	170	355	185	374	210	439	420	439	465
	60	60	-	-	-	-	387	145	423	155	445	180	523	350	523	390
	65	65	-	-	-	-	-	-	-	-	-	-	613	300	613	330
	70	70	-	-	-	-	-	-	-	-	-	-	711	260	711	285
	75	75	-	-	-	-	-	-	-	-	-	-	816	225	816	250
	85	85	-	-	-	-	-	-	-	-	-	-	1049	175	1049	195
	95	95	-	-	-	-	-	-	-	-	-	-	1310	140	1310	155

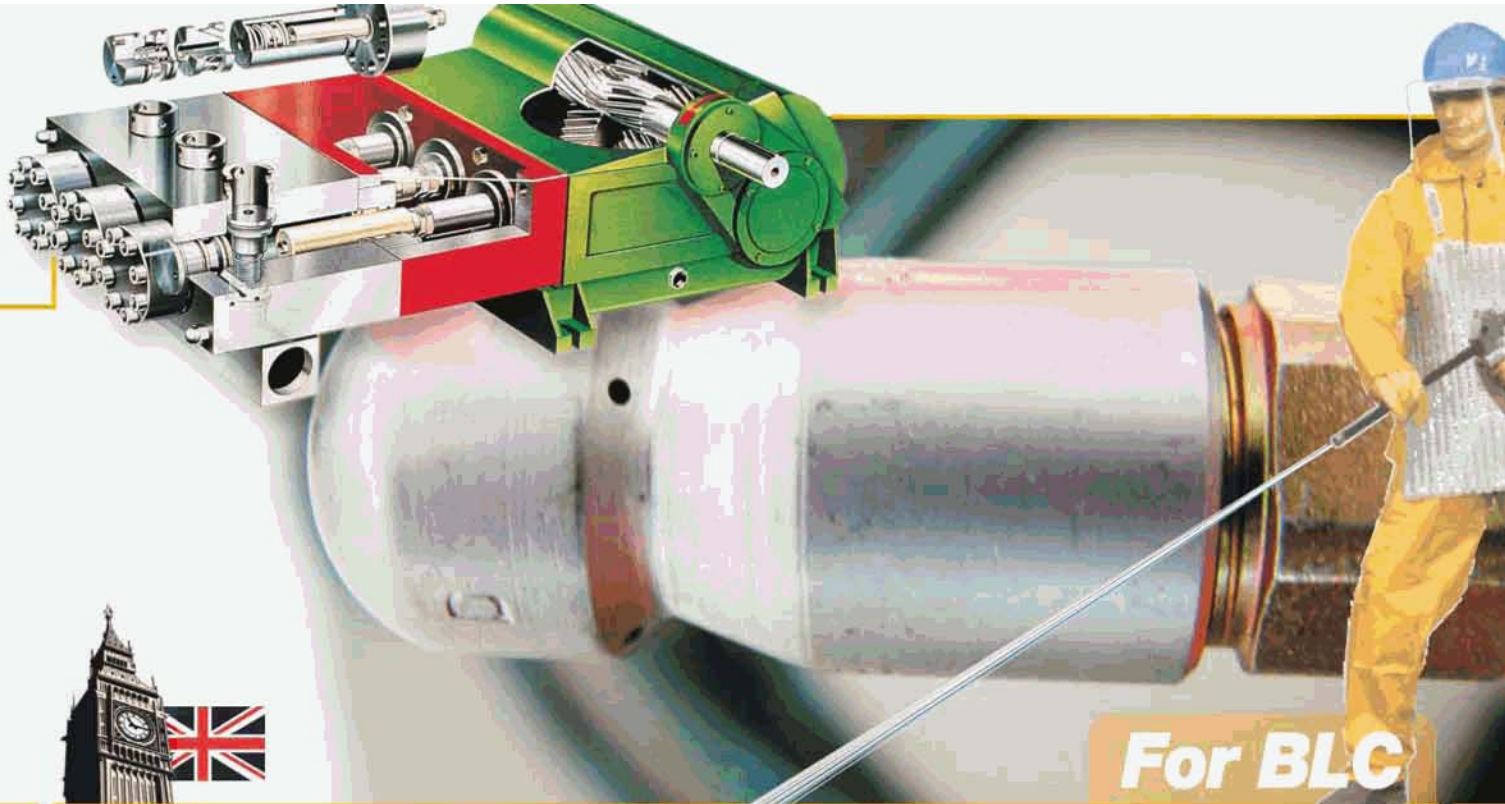
Unit	Idroscal 45 Kw	90 Kw	110 Kw	130 Kw	160 Kw	350 Kw	400 Kw
	<i>Skid mounted</i>						
	R.p.m.	650	530	435	475	500	440
Electric	Dim (LxwxA) mm	2100x3000x1100	2000x1300x1100	2200x1300x1200	2200x1300x1200	2200x1300x1200	-
	Peso Kg	700	1000	1400	1400	1700	-
Diesel	Dim (LxwxA) mm	2300x1400x1100	3000x1500x1500	3000x1500x1500	3000x1500x1500	3000x1500x1500	4000x2000x2000
	Weight Kg	1100	1400	1500	1600	1500	3500
	Lubrication	Oil bath	Forced circulation	Oil bath	Forced circulation	Forced circulation	Forced circulation

#### On request:

- Higher power pumps
- On trolley with sound proof version
- NAVY Version







**For BLC**

Pumps		45 Kw		90 Kw		110 Kw		130 Kw		160 Kw		350 Kw		400 Kw	
Cod.	inches	US gpm	Psi	US gpm	Psi	US gpm	Psi	US gpm	Psi	US gpm	Psi	US gpm	Psi	US gpm	Psi
14	0.55	3.96	22191	4.76	33359	-	-	-	-	-	-	-	-	-	-
16	0.63	5.28	16969	6.34	29007	-	-	-	-	-	-	-	-	-	-
18	0.71	6.60	13633	7.92	20233	9.25	23641	10.04	25381	10.57	29007	-	-	-	-
20	0.79	8.19	11023	9.77	16389	11.36	18927	12.42	20740	12.94	23206	-	-	-	-
22	0.87	9.77	9137	11.89	13488	13.74	15592	15.06	17114	15.59	18855	-	-	-	-
24	0.94	11.62	7687	14.27	11385	16.38	13126	17.96	14431	18.76	15954	-	-	-	-
26	1.02	13.74	6526	16.64	9645	19.28	11168	20.87	12256	21.93	13779	25.89	27267	25.89	29007
28	1.10	15.85	5656	19.28	8340	22.19	9645	24.30	10588	25.62	11748	30.12	24496	30.12	26397
30	1.18	18.23	4931	22.19	7252	25.62	8412	28.00	9210	29.32	10298	34.61	20885	34.61	22916
32	1.26	20.60	4279	25.36	6382	29.06	7324	31.70	8122	33.29	8992	39.37	18347	39.37	20305
36	1.42	26.15	3408	31.96	5004	36.72	5802	40.15	6382	42.27	7107	49.67	14504	49.67	15954
40	1.57	32.23	2756	39.63	4061	45.44	4714	49.66	5149	52.04	5802	61.29	11748	61.29	13053
45	1.77	40.95	2176	50.19	3191	57.59	3698	62.87	4061	66.04	4569	77.67	9282	77.67	10225
50	1.97	50.46	1740	61.82	2611	71.06	2973	77.67	3263	81.63	3698	95.89	7324	95.89	8122
55	2.17	61.29	1450	74.76	2176	86.12	2466	93.78	2683	98.80	3046	115.97	6091	115.97	6744
60	2.36	-	-	-	-	102.23	2103	111.74	2248	117.56	2611	138.16	5076	138.16	5656
65	2.56	-	-	-	-	-	-	-	-	-	-	161.94	4351	161.94	4786
70	2.76	-	-	-	-	-	-	-	-	-	-	187.83	3771	187.83	4134
75	2.95	-	-	-	-	-	-	-	-	-	-	215.56	3263	215.56	3626
85	3.35	-	-	-	-	-	-	-	-	-	-	277.12	2538	277.12	2828
95	3.74	-	-	-	-	-	-	-	-	-	-	346.06	2030	346.06	2248

Unit	Idroscal 45 Kw	90 Kw	110 Kw	130 Kw	160 Kw	350 Kw	400 Kw
	<i>Skid mounted</i>						
	R.p.m.	650	530	435	475	500	440
Electric	Dim (LxWxA) Ft	6.89 x 9.94 x 3.61	6.56 x 4.26 x 3.61	7.22 x 4.26 x 3.94	7.22 x 4.26 x 3.94	7.22 x 4.26 x 3.94	-
	Peso Lb	1540	2200	3080	3080	3740	-
Diesel	Dim (LxWxA) Ft	7.55 x 4.59 x 3.61	9.84 x 4.92 x 4.92	9.84 x 4.92 x 4.92	9.84 x 4.92 x 4.92	9.84 x 4.92 x 4.92	13.12 x 6.56 x 6.56
	Weight Lb	2420	3080	3300	3520	3300	7720
	Lubrication	Oil bath	Forced circulation	Oil bath	Forced circulation	Forced circulation	Forced circulation

**On request:**

- Higher power pumps
- On trolley with sound proof version
- NAVY Version







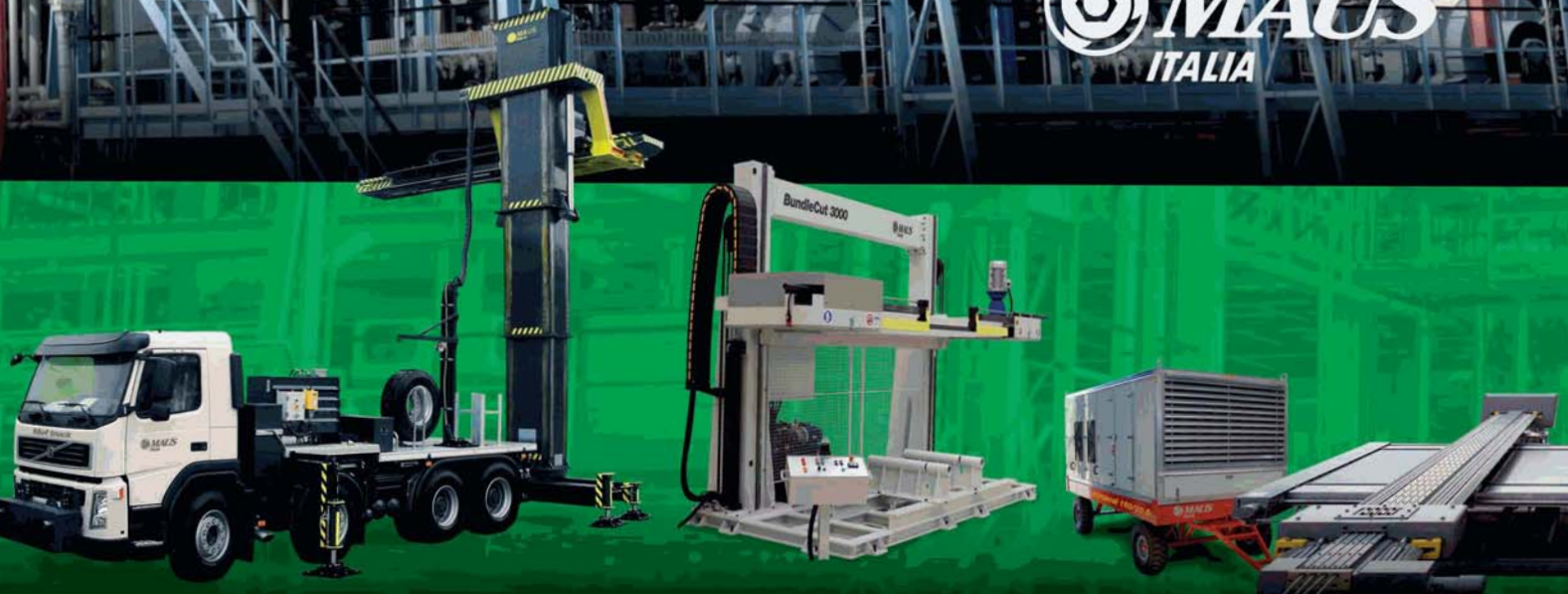
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# Choice the best technology for Your refinery plant maintenance

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ITALIA





# Mechanical internal cleaning (straight tubes only)

## Hardscal



Simple to use  
Versatility

## Pneumatic shafting tube cleaners for tube bundle heat-exchangers

The pneumatic shafting tube cleaners with tool water cooling system are the simplest and most effective solution to clean the heat exchanger tubes even when completely obstructed. The continuous flow of water (max pressure 20 Bar - 290 psi) through holes in the tools provides cooling during the process and helps to drain away the material removed from the tubes.

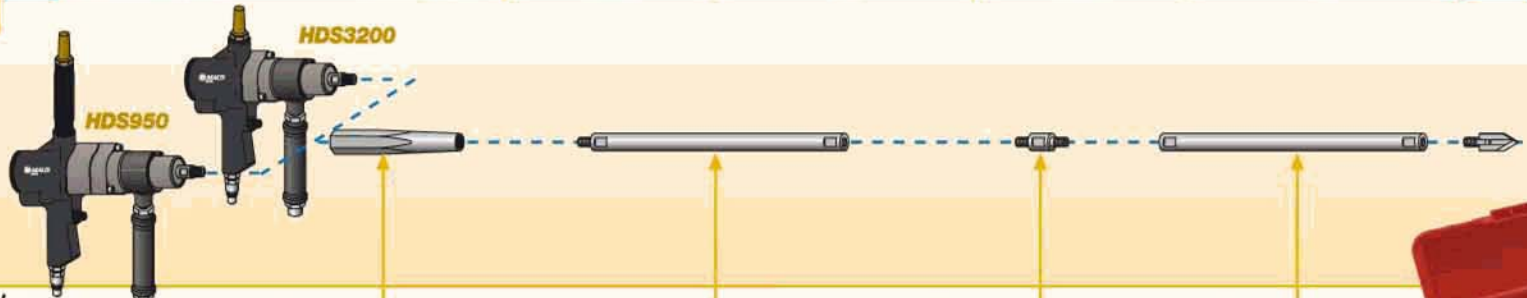


### Hardscal

### HDS3200

### HDS950

R.p.m.		3200	3200	950	950
Tube I.D. (from-to)	mm "	9,5 ÷ 25,4	3/8" ÷ 1"	9,5 ÷ 44,4	3/8" ÷ 1.3/4"
Dimensions L x D x H/H1	mm "	242 x 66 x 300/400	9.5"x 2.6"x 11.8"/15.8"	277 x 66 x 300/400	10.9"x 2.6"x 11.8"/15.8"
Weight	Kg Lb	3,5	7,8	4,5	10
Pressure	Bar Psi	6-7	90-100	6-7	90-100
Air consumption	Lt/min Cfm	840	30	840	30

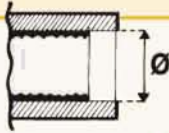


mm		"		Drive coupling		Drive shaft			Shaft coupling		Driven shaft	
Model	Thread	Model	mm	"	Thread	Model	Thread	Model	Thread	Model	Thread	
MAT-337-A	5/8" NF x 1/4" NF	MCC-336	6,35	1/4	1/4" NFM x 10-32 F	MCC-334	10-32 M	MCC-335	10-32 FX 10-32 F			
MAT-333-A	5/8" NF x 5/16" NF	MCC-332	7,94	5/16	5/16" NFM x 1/4" NFF	MCC-330	1/4" NFM	MCC-331	1/4" NFF x 1/4" NFF			
MAT-321-A	5/8" NF x 3/8" NF	MCC-324	9,52	3/8	3/8" NFM x 1/4" NFF	MCC-322	1/4" NFM	MCC-323	1/4" NFF x 1/4" NFF			
MAT-313-A	5/8" NF x 7/16" NF	MCC-316	11,11	7/16	7/16" NFM x 5/16" NFF	MCC-314	5/16" NFM	MCC-315	5/16" NFF x 5/16" NFF			
MAT-309-A	5/8" NF x 1/2" NF	MCC-312	12,70	1/2	1/2" NFM x 3/8" NFF	MCC-310	3/8" NFM	MCC-311	3/8" NFF x 3/8" NFF			
MAT-305-A	5/8" NF x 9/16" NF	MCC-308	14,29	9/16	9/16" NFM x 3/8" NFF	MCC-306	3/8" NFM	MCC-307	3/8" NFF x 3/8" NFF			
MAT-301-A	5/8" NF x 5/8" NF	MCC-304	15,88	5/8	5/8" NFM x 3/8" NFF	MCC-302	3/8" NFM	MCC-303	3/8" NFF x 3/8" NFF			
MAT-317-A	5/8" NF x 3/4" NF	MCC-320	19,05	3/4	3/4" NFM x 7/16" NFF	MCC-318	7/16" NFM	MCC-319	7/16" NFF x 7/16" NFF			
MAT-325-A	5/8" NF x 1" NF	MCC-328	25,40	1	1" NFM x 7/16" NFF	MCC-326	7/16" NFM	MCC-327	7/16" NFF x 7/16" NFF			

Each single type of work requires specific equipment and tools.  
Clients are invited to submit their problems to our Technical Department in order to find the right solution.



# Cleaning drills and brushes



WIDIA TIPS

mm		"		mm		"		mm		"		MAT	MTW	MCB	MCT	MB
9,12 ÷ 9,88	0.359 ÷ 0.389	8,7	0.343									MAT 201	MTW 201	MCB 201	MCT 201	MB 201
9,91 ÷ 10,67	0.390 ÷ 0.420	9,5	0.375			6,35	1/4					MAT 202	MTW 202	MCB 202	MCT 202	MB 202
10,69 ÷ 11,48	0.421 ÷ 0.452	10,3	0.406									MAT 203	MTW 203	MCB 203	MCT 203	MB 203
11,48 ÷ 12,27	0.452 ÷ 0.483	11,1	0.437									MAT 204	MTW 204	MCB 204	MCT 204	MB 204
12,29 ÷ 13,06	0.484 ÷ 0.514	11,9	0.468									MAT 205	MTW 205	MCB 205	MCT 205	MB 205
13,08 ÷ 13,84	0.515 ÷ 0.545	12,7	0.500			7,93	5/16					MAT 206	MTW 206	MCB 206	MCT 206	MB 206
13,87 ÷ 14,66	0.546 ÷ 0.577	13,5	0.531									MAT 207	MTW 207	MCB 207	MCT 207	MB 207
14,68 ÷ 15,44	0.578 ÷ 0.608	14,3	0.562									MAT 208	MTW 208	MCB 208	MCT 208	MB 208
14,68 ÷ 15,44	0.578 ÷ 0.608	14,3	0.562									MAT 108	MTW 108	MCB 108	MCT 108	MB 108
15,47 ÷ 16,23	0.609 ÷ 0.639	15,1	0.593									MAT 209	MTW 209	MCB 209	MCT 209	MB 209
16,26 ÷ 17,15	0.640 ÷ 0.675	15,9	0.625									MAT 210	MTW 210	MCB 210	MCT 210	MB 210
17,17 ÷ 17,93	0.676 ÷ 0.706	16,7	0.656									MAT 211	MTW 211	MCB 211	MCT 211	MB 211
17,96 ÷ 18,72	0.707 ÷ 0.737	17,5	0.687									MAT 212	MTW 212	MCB 212	MCT 212	MB 212
18,75 ÷ 19,53	0.738 ÷ 0.769	18,2	0.718									MAT 213	MTW 213	MCB 213	MCT 213	MB 213
19,56 ÷ 20,32	0.770 ÷ 0.800	19,1	0.750									MAT 214	MTW 214	MCB 214	MCT 214	MB 214
20,35 ÷ 21,11	0.801 ÷ 0.831	19,9	0.781			9,52	3/8					MAT 215	MTW 215	MCB 215	MCT 215	MB 215
21,13 ÷ 21,89	0.832 ÷ 0.862	20,6	0.812									MAT 216	MTW 216	MCB 216	MCT 216	MB 216
21,92 ÷ 22,71	0.863 ÷ 0.894	21,4	0.843									MAT 217	MTW 217	MCB 217	MCT 217	MB 217
22,73 ÷ 23,50	0.895 ÷ 0.925	22,2	0.875									MAT 218	MTW 218	MCB 218	MCT 218	MB 218
23,52 ÷ 24,28	0.926 ÷ 0.956	23,0	0.906									MAT 219	MTW 219	MCB 219	MCT 219	MB 219
24,31 ÷ 25,07	0.957 ÷ 0.987	23,8	0.937									MAT 220	MTW 220	MCB 220	MCT 220	MB 220
25,35 ÷ 26,01	0.998 ÷ 1.024	24,6	0.968									MAT 221	MTW 221	MCB 221	MCT 221	MB 221
26,04 ÷ 26,80	1.025 ÷ 1.055	25,4	1.000									MAT 222	MTW 222	MCB 222	MCT 222	MB 222
26,82 ÷ 27,58	1.056 ÷ 1.086	26,2	1.031									MAT 223	MTW 223	MCB 223	MCT 223	MB 223
27,61 ÷ 28,37	1.087 ÷ 1.117	27,0	1.062									MAT 224	MTW 224	MCB 224	MCT 224	MB 224
28,40 ÷ 29,18	1.118 ÷ 1.149	27,8	1.093									MAT 225	MTW 225	MCB 225	MCT 225	MB 225
29,21 ÷ 29,97	1.150 ÷ 1.180	28,6	1.125									MAT 226	MTW 226	MCB 226	MCT 226	MB 226
30,00 ÷ 30,76	1.181 ÷ 1.211	29,4	1.156									MAT 227	MTW 227	MCB 227	MCT 227	MB 227
30,78 ÷ 31,55	1.212 ÷ 1.242	30,2	1.187									MAT 228	MTW 228	MCB 228	MCT 228	MB 228
31,57 ÷ 32,51	1.243 ÷ 1.280	30,9	1.218			11,11	7/16					MAT 229	MTW 229	MCB 229	MCT 229	MB 229
32,54 ÷ 33,30	1.281 ÷ 1.311	31,8	1.250									MAT 230	MTW 230	MCB 230	MCT 230	MB 230
33,32 ÷ 34,09	1.312 ÷ 1.342	32,5	1.281									MAT 231	MTW 231	MCB 231	MCT 231	MB 231
34,11 ÷ 34,90	1.343 ÷ 1.374	33,3	1.312									MAT 232	MTW 232	MCB 232	MCT 232	MB 232
34,93 ÷ 35,69	1.375 ÷ 1.405	34,1	1.343									MAT 233	MTW 233	MCB 233	MCT 233	MB 233
35,71 ÷ 36,47	1.406 ÷ 1.436	34,9	1.375									MAT 234	MTW 234	MCB 234	MCT 234	MB 234

## Drills choice

Completely obstructed tubes  
Partially obstructed tubes  
Brushing

friable deposits

tough deposits

MAT

MCB

MTW

MCT

MB

The **HDS** machine is supplied inside its box complete with:

- 1 Air hose 1/2" mm Length = 6 m
- 1 Water hose 3/8" Length = 6 m
- 1 Muffler
- 1 Additional handle
- 1 Water handle valve
- 1 Air lubricator
- 1 Set of spare vanes
- 1 Set of service wrenches
- 1 Operating handbook

