MOBICRANE

For small goods handling in a flexible environment

Vacuum or mechanical gripping tools for all purposes.

Lifting capacity : 50kg

Technical Data

- telescopic adjustable column for lifting heights between 1.760mm to 2.735mm. (increments of 100mm)

- total height min. 2050mm, max. 3030mm

- slewing arm with elbow joint. All slewing joints on ball bearings

- built on a circular foundation with an adapter enabling the unit to be picked up and moved with a manual standard pallet truck or similar

- weight app. 353kg (excl. gripping tool)

- sound level 71dB (A) / 69 dB (B)

Features

- for use with mechanical gripping tools or high capacity vaccum gripping tools. Maximum load 50kg

- vacuum is generated by a pneumatic vacuum pump (vacuum ejector) with high flow capacity

- the lifting action is generated by an electric motor, 24 V DC

- batteries and battery charger are on-board and standard

- a compressed air connection is needed to power the vacuum ejector. 300-600 l/m @ 6 bar (11-21 cfm @ 87 psi)

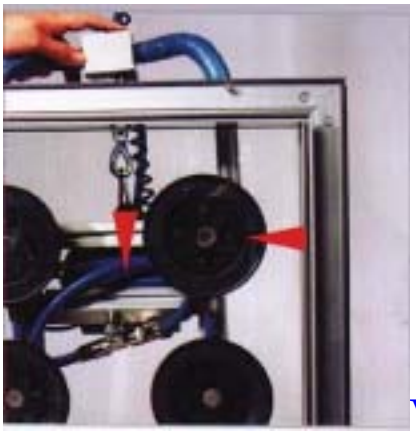
- lifting and lowering speeds are adjustable

- extensive safety functions are integrated

- gripping tools can be modified for customer specific handling applications

High level of safety

AVSG - Accidental vacuum shut-off guard



VMS Vacuum-Monitoring-System to secure the gripping force

.Anti-tilt design to prevent the lift from tipping over

Pallet Truck Relocation

The mechanically powered unit has a 24V Battery with built in charger. It is easily moved with a pallet truck. It has a variable lifting/lowering speed.

MOBICRANE

The Mobicrane is available with the new Mach 2+ supersonic vacuum ejector for clients with a suitable compressed air supply. For the client without a suitable air supply, an electrical vacuum pump can be fitted as standard.

Mach2+ technical details - see page 6

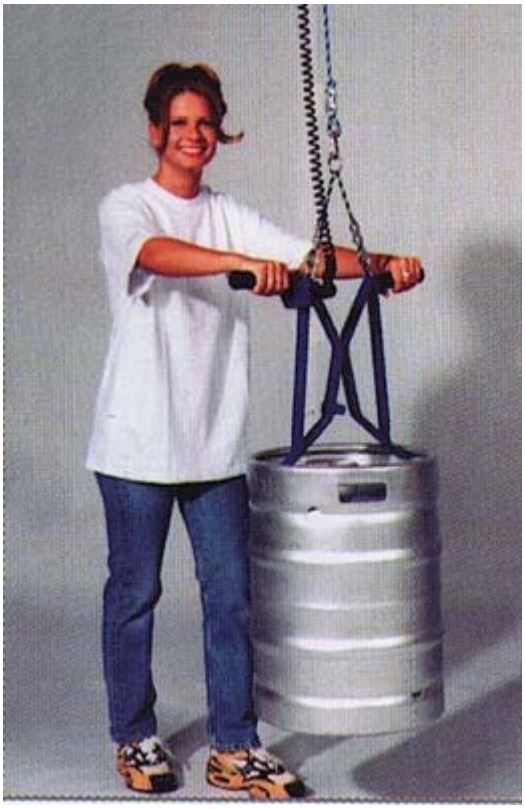
The Mobicrane is ideal for lifting fragile products within cardboard packaging

Gripping tools for all handling applications

Standard gripping tool - MCG-EV and MCG-PV

Vacuum gripping tools for either pneumatic vacuum pump or 24V electric vacuum pump. Maximum 50kg. To lift glass, metal, cardboard boxes, etc.

Control unit for use with mechanical standard gripping tools.



Special gripping tool for barrels and crates

Standard gripping tool

Flat Objects

Round Objects

MACH 2$^+$ SUPERSONIC VACUUM EJECTORS

INCREASE YOUR PROFIT !

BY INCREASING YOUR PRODUCTION RATE:

MACH 2$^+$ Supersonic Vacuum Ejector has more pumping capacity per liter drive air than any single stage venturi Ejector, and more than three stage venturi Ejectors above35% vacuum. This means that :

- A pick-and-place robot or automated production machines get the 'ready-to-go' signal sooner at the picking moment and reduces thus the pick-and-place and cycle time.

- A vacuum molding tool for plastic materials will be evacuated quicker and thus increasing the production rate.

- A flushing vacuum toilet will flush quicker and increase its capacity.

- And all other applications where a more efficient vacuum ejector increases the production rate.

BY LOWERING YOUR COST

MACH 2$^+$ Supersonic Vacuum Ejector consumes less air and compressed air costs money. Furthermore, **MACH 2$^+$ Supersonic Vacuum Ejectors** has no mowing parts and consists of only two parts. There are no seals, o-rings or rubber flaps. This means that:

- The reliability of the **MACH 2$^+$ Supersonic Vacuum Ejector** is extremely high.

- The cost of maintenance is reduced, if not eliminated, because the **MACH 2$^+$ Supersonic Vacuum Ejector** is quicker and easier to overhaul. Two parts compared to over fifty for a typical multistage venturi ejector reduces the time needed for disassemble and reassemble to only a few minutes.

- The **MACH 2$^+$ Supersonic Vacuum Ejector** will last 'for-ever' since it is available in various materials for any aggressive environment. For example acid proof stainless steel, PVC or other polymeric materials.

MACH 2$^+$ Supersonic Vacuum Ejector HAVE THE FOLLOWING TECHNICAL ADVANTAGES OVER VENTURI EJECTORS:

- Higher vacuum flows in the range 40 - 85 % vacuums. This result in quicker suction build-up and better ability to hold heavy loads when having leaking or porous surfaces.

- Much more compact and much lower weight. Only 1/5th of the size of a typical multistage venturi ejector. Therefor easier to build into various systems or machines.

- Manufactured in various materials. Ex stainless steel and PVC for aggressive environments.

No rubber flaps, gaskets or O-rings gives trouble free operation in cold environments.

ADVANTAGES OF

MACH 2^{+} Supersonic Vacuum Ejector

COMPARED TO MECHANICAL VACUUM PUMPS.

* No moving parts * Light weight

* No gaskets or O-rings * Lower Price

* Maintenance free * Cool running

* Quick suction build-up * Easy to regulate

* Small dimensions * No explosion risk

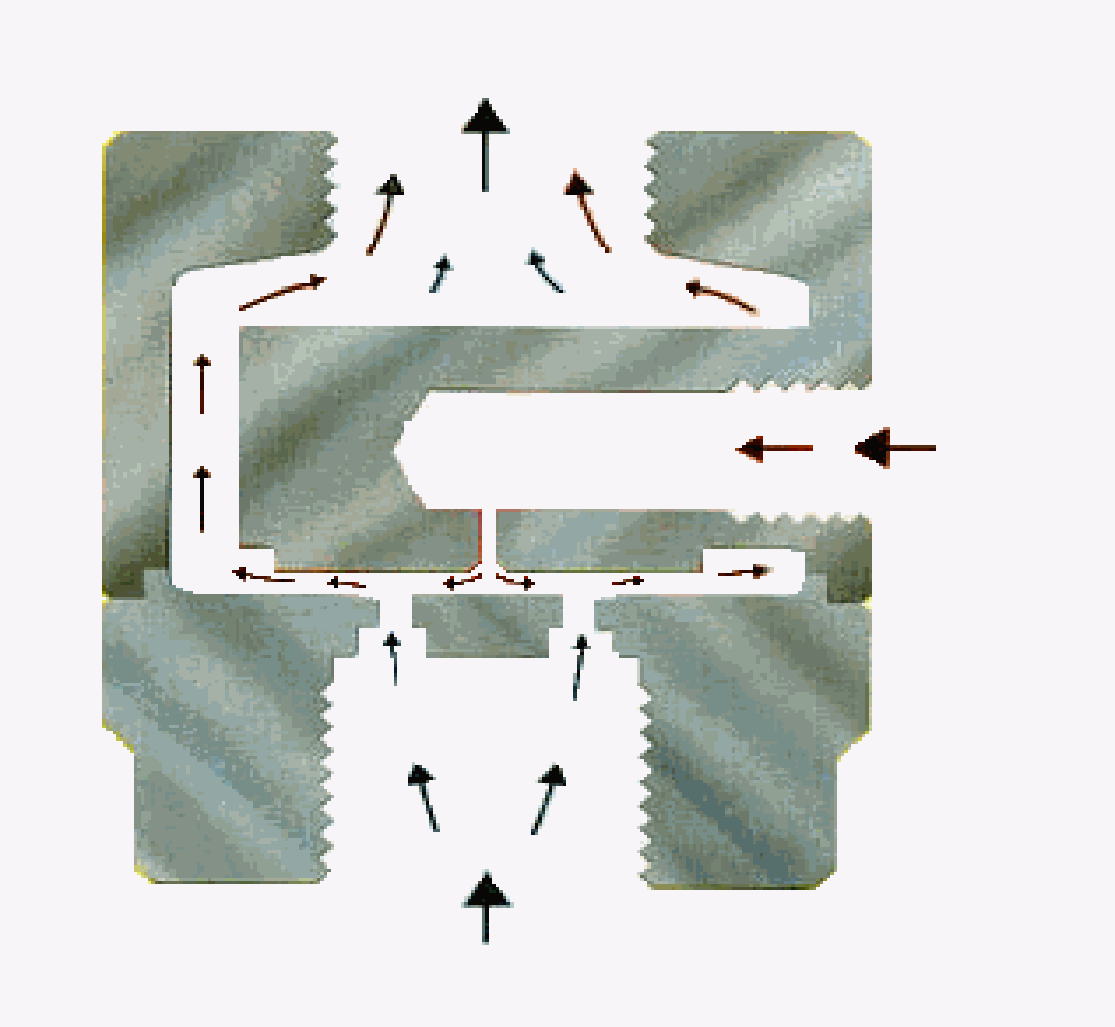


fig 1. Schematic drawing of **MACH 2^{+}** Supersonic Vacuum Ejector

THE WORKING PRINCIPLE OF

MACH 2^{+} Supersonic Vacuum Ejector

MACH 2^{+} Supersonic Vacuum Ejector are based on circular geometry. The compressed air can be attached either axially from above or radially from the side. Inside the ejector the air is led toward the center. When the air reaches the center it is spread radially outward in all directions. The airflow is accelerated to barely subsonic or supersonic speeds, depending on the type of ejector.

When the desired speed has been reached the air passes over a gap, which is when the ejector effect is achieved. That is to say, a vacuum is produced in the gap, which draws air up out of the gap. The sucked air mixes with the compressed air in a diffuser, until it is slowed down and led to the outlet**,** either through a silencer or directly into the atmosphere.

MACH 2^{+} Supersonic Vacuum Ejector are the most compact and lightweight vacuum ejectors on the market. The compact design makes them easy to install in all applications and systems.

The construction has neither moving parts nor rubber valves. Therefore it is extremely reliable, even in subzero temperatures. **MACH 2^{+} Supersonic Vacuum Ejector** consist of two parts and therefore can be cleaned when necessary in less than a minute. The ejector requires the same air filtering as conventional venturi ejectors.

HV – High Vacuum ejectors

MACH 2^{+} HV ejector models are used when vacuum levels of over 55% are wanted. HV models achieve 85-88% vacuum. HV models have a good vacuum flow at high vacuum levels compared to venturi models.

HF – High Flow ejectors

MACH 2^{+} HF ejector models are used when there is leakage and vacuum levels below 60% are wanted. HF models achieve 60% vacuum and have a good vacuum flow at the upper vacuum levels. HF models are often compared to multi-stage venturi ejectors.

PRODUCT OVERVIEW –

SINGEL INLET MACH 2^{+} Supersonic Vacuum Ejector PROGRAM

HF - High Flow - Vacuum Ejectors

Modell	Max. vacuum	Vacuum flow / Evacuation time 10 litre vessel						Air consump	Rec. pressure	Pressure range
		-20 kPa		-40 kPa		-60 kPa				
	-kPa	NL/min	Sec	NL/min	Sec	NL/min	Sec	NL/min	kPa g	kPa g
HF 40 P	65(70*)	17	3,00	10	10,50	-----	-----	40	500	300-700
HF 60 P	62(75*)	27	2,00	17	6,00	-----	-----	60	500	300-700
HF 100	62 (75*)	74	0,40	40	1,80	-----	-----	108	500	300-700
HF 200	62 (74*)	170	0,30	95	1,00	-----	-----	220	500	300-700
HF 300	63 (80*)	235	0,25	135	0,60	-----	-----	320	500	300-700
HF 450	60 (78*)	317	0,16	136	0,55	-----	-----	480	500	300-700
HF 600	62 (78*)	335	0,11	141	0,47	-----	-----	650	500	300-700
HF 1000	62 (73*)	655	0,046	397	0,23	-----	-----	1100	500	300-540
HF 1150	62 (80*)	800	0,033	407	0,21	-----	-----	1250	500	300-600
HF 1500	62 (68*)	892	0,030	436	0,21	-----	-----	1600	500	300-600

* Values for max. vacuum within parenthesis refers to maximum vacuum for maximum stated pressure.

P = polymeric material

HV - High Vacuum - Vacuum Ejectors

Model	Max. vacuum	Vacuum flow / Evacuation time 10 litre vessel						Air consump	Rec. pressure	Pressure range
		-20 kPa		-40 kPa		-60 kPa				
	-kPa	NL/min	Sec	NL/min	Sec	NL/min	Sec	NL/min	kPa g	kPa g
HV 80	80	31,2	1,40	21	4,80	9,5	12,20	88	450	420-520
HV 150	85	78	0,60	59	1,90	33	4,20	170	450	420-520
HV 300	85	130	0,35	102	1,10	57	2,50	350	450	420-520
HV 600	85	167	0,25	126	0,85	77	1,90	630	450	420-520
HV 1000	85	289	0,16	193	0,54	86	1,40	1100	450	420-520
HV 2000	85	535	0,10	319	0,34	113	0,95	2000	450	420-520

Values for vacuum flow, max. vacuum, evacuation time and air consumption are related to "Rec. press."

WORKING PRINCIPLE OF

MACH 2^{+} SUPERSONIC MULTI-INLET VACUUM EJECTORS

The MACH 2^{+}- MI program is also based on a circular geometry. The compressed air is connected radially from the side. The MI-ejectors have the same main functions as HF- and HV-models. The difference is that when the airflow has reached the desired speed the air passes over several separated gaps instead of one gap, whereby the ejector effect is achieved in each of the chambers. The MI Ejector means that we have several ejectors with a shared connection for compressed air and shared silencer, but with separate vacuum inlet**.** The MI Ejector is suitable for use when lifting with suction cups. MI-models are unique in that even if one or more suction cups "misses" its load, and begins to suck air, the other suction cups do not lose their

vacuum, and thereby retain their load-lifting capacity. This cannot be achieved with other vacuum ejectors without the installation of expensive check valves, flow valves etc., which also increase the need for service and maintenance.

The MACH 2^+- MI-program has neither moving parts nor rubber valves. Therefore it is extremely dependable and reliable. The absence of moving rubber parts also makes it reliable in subzero temperatures. MACH 2^+- MI-ejectors consist of two parts and therefore can be cleaned when necessary in less than a minute. The ejector requires the same air filtering as conventional venturi ejectors.

MACH 2^+- MI-Ejectors can be seen as 4, 6 or 8 small ejectors with a shared compressed air connection and a shared silencer, but with separate vacuum inlets. The vacuum level is retained even when one or more other inlets are "sucking air". This makes the MI-models well suited – when lifting, - in confined spaces, - when a centrally located ejector is wanted, or when a minimum of maintenance is desired.

MIHF – Multi-inlet High Flow Ejectors

The MIHF series achieves about 60% vacuum level at 500 kPa pressure on the inlet and has good vacuum flow. This makes these ejectors suitable when there is leakage and a risk of some suction cups not gripping, or when vacuum levels under 60% are wanted. The MHIF series is suitable as a replacement for small venturi ejectors with air consumption of up to 80 liters/minute.

MIHV – Multi-inlet High Vacuum Ejectors

The maximum vacuum level for the MIHV series is 79-84% at 500 kPa pressure on the inlets and they are suitable as a replacement for small venturi ejectors with an air consumption of up to 60 liters/minute. These ejectors are suitable where a high vacuum level is wanted, while there is a risk of some suction cups not gripping.

PRODUCT OVERVIEW –

MULTI INLET VACUUM EJECTOR PROGRAM

MIHF - Multi Inlet High Flow - Vacuum Ejectors

Model	Max. vacuum	Vacuum flow / Evacuation time 1 litre vessel						Air consump	Rec. pressure	Pressure range
		-20 kPa		-40 kPa		-60 kPa				
	-kPa	NL/min	Sec	NL/min	Sec	NL/min	Sec	NL/min	kPa g	kPa g
MI 4/25 HF	62	15,9	0,27	8,3	1,10	-----	-----	28	500	450-600
MI 8/30 HF	61	19,2	0,23	10,9	0,80	-----	-----	30	500	450-600
MI 6/40 HF	62	20,2	0,19	9,1	0,80	-----	-----	40	500	450-600
MI 8/40 HF	61	26,0	0,14	15,5	0,60	-----	-----	50	500	450-600
MI 4/60 HF	60	27,2	0,13	15,9	0,60	-----	-----	60	500	450-600
MI 6/55 HF	61	30,6	0,11	17,4	0,60	-----	-----	61	500	450-600
MI 4/80 HF	62	36,5	0,08	24,9	0,40	-----	-----	94	500	450-600

MIHV - Multi Inlet High Vacuum - Vacuum Ejectors

Model	Max. vacvuum	Vacuum flow / Evacuation time 1 litre vessel						Air consump	Rec. pressure	Pressure range
		-20 kPa		-40 kPa		-60 kPa				
	-kPa	NL/min	Sec	NL/min	Sec	NL/min	Sec	NL/min	kPa g	kPa g
MI 4/20 HV	78	7,0	0,60	4,2	2,60	1,8	6,70	25	500	450-600
MI 6/30 HV	80	10,1	0,22	7,5	1,40	3,1	3,70	33	500	450-600
MI 4/40 HV	82	15,0	0,17	10,9	1,00	5,6	2,40	42	500	450-600
MI 8/40 HV	82	15,0	0,17	10,9	1,00	5,8	2,20	48	500	450-600
MI 6/55 HV	82	20,0	0,15	15,0	0,70	8,3	1,70	65	500	450-600

Values for vacuum flow, max. vacuum, evacuation time and air consumption are related to "Rec. press."

USE AND MAINTENANCE

1. CORRECT PRESSURE OF AIR SUPPLY.

Recommended air pressure is 450 - 550 kPa gauged depending on ejector model. Air pressure refers pressure measured under operation and right before the air connection. Lower pressure will reduce the performance, higher will increase the air consumption. Be cautious with pressure drops due to long or to small hoses and connections. Always use same hose diameter as the air supply connection. If there are any doubts use the formula below to determine the size of a potential pressure drop. Adding this pressure drop to the recommended pressure gives the pressure needed for optimal operation.

2. FILTRATION OF AIR SUPPLY.

Liquid oil, water and dirt should be filtered from the air supply. If the ejector should get contaminated the performance can gradually be reduced. The ejector can easily be disassembled and cleaned.

3. RESTRICTION OF THE OUTLET

Restriction of the airflow at the outlet should be avoided. If a restriction is introduced the pumping capacity can gradually be reduced with the size of the restriction. Only use silencers that do not introduce restrictions in the airflow.

4. RESTRICTION OF THE VACUUM INLET.

Restriction of the vacuum inlet should be avoided. A restriction at the vacuum inlet can gradually reduce the vacuum flow with increasing restriction.

Pressure drops in air supply lines.

$$\Delta P = \frac{L \times 1{,}6 \times 10^{12} \times qv^{1.85}}{d^5 \times P_a}$$

Where: ΔP = pressure drop in kPa

L = length of line or hose in m

qv = air flow in m^3/sec (i.e. the air consumption of the ejector)

d = inside diameter of line or hose in mm

P_a = Absolute air pressure at the beginning of the line in kPa.

SYMBOLS, UNITS AND CONVERSION FACTORS

Symbols

A = Area

D or ϕ = Diameter

F = Force [Newton, N]

g = gravitational acceleration [kg/s^2]

P = Pressure (SI-unit is Pascal, Pa)(1 Pa = 1 N/m^2)

ΔP = Pressure difference [kPa]

P- = sub atmospheric pressure (-kPa)

P+ = pressure above atmospheric pressure

Unit Conversion Factors

To convert from -------- To --------- Multiply by -------- or To -------- Multiply by

Pressure, stress (force per unit area)

Atmosphere

(normal,760 torr) --------Pa -------- 1,013 x 10^5 ----------kPa ----------101,3

Inch of mercury ---------Pa ---------3,377 x 10^3 ----------kPa ----------3,377

Kilogram-force/cm^2 -----Pa ---------9,807 x 10^4 ----------kPa ----------98,07

mm of mercury ----------Pa ---------1,333 x 10^2 ----------Pa _____133,3

pound-force/sqFoot -----Pa ---------4,788 x 10 ----------Pa ----------47,88

pound-force/sqInch -----Pa ---------6,895 x 10^3 ----------kPa ----------6,895

bar ----------Pa ----------1,0 x 10^5 ----------kPa _____100

torr ----------Pa ---------133,322 ----------kPa _____0,133

Volume per unit time

$foot^3$/ min (cfm) --------m^3/s --------4,719 x 10^4 ----------dm^3/s---------- 0,4719

$foot^3$/ sec ----------m^3/s ---------2,832 x 10^2 ---------dm^3/s ----------28,32

gallon/min ----------m^3/s ---------6,309 x 10^5 ----------cm^3/s ----------63,09