Part 4: MULTI-CIRCUIT EJECTORS

MULTI-CIRCUIT Ejectors

Ejectors with 4, 5, 6 or 8 separate vacuum circuits in size 10, 20 and 30. The ejectors offers a simple mounting and a good overview and is equipped with a rapid release function which is patented by AVAC.

Air operated blow-off

See page 7

Solenoid operated blow-off

See page 7

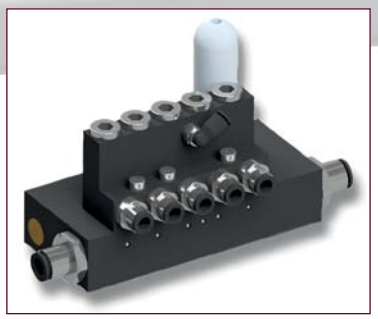
Equipped with AVAC Monitoring System (AMS)

See page 9

PATENTED

See page 9

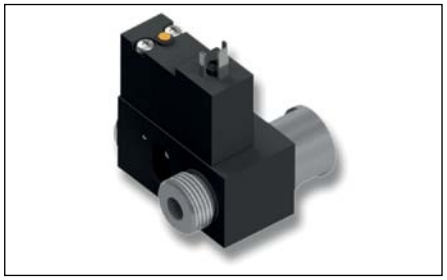
Equipped with Vacuum holding valves



See page 13

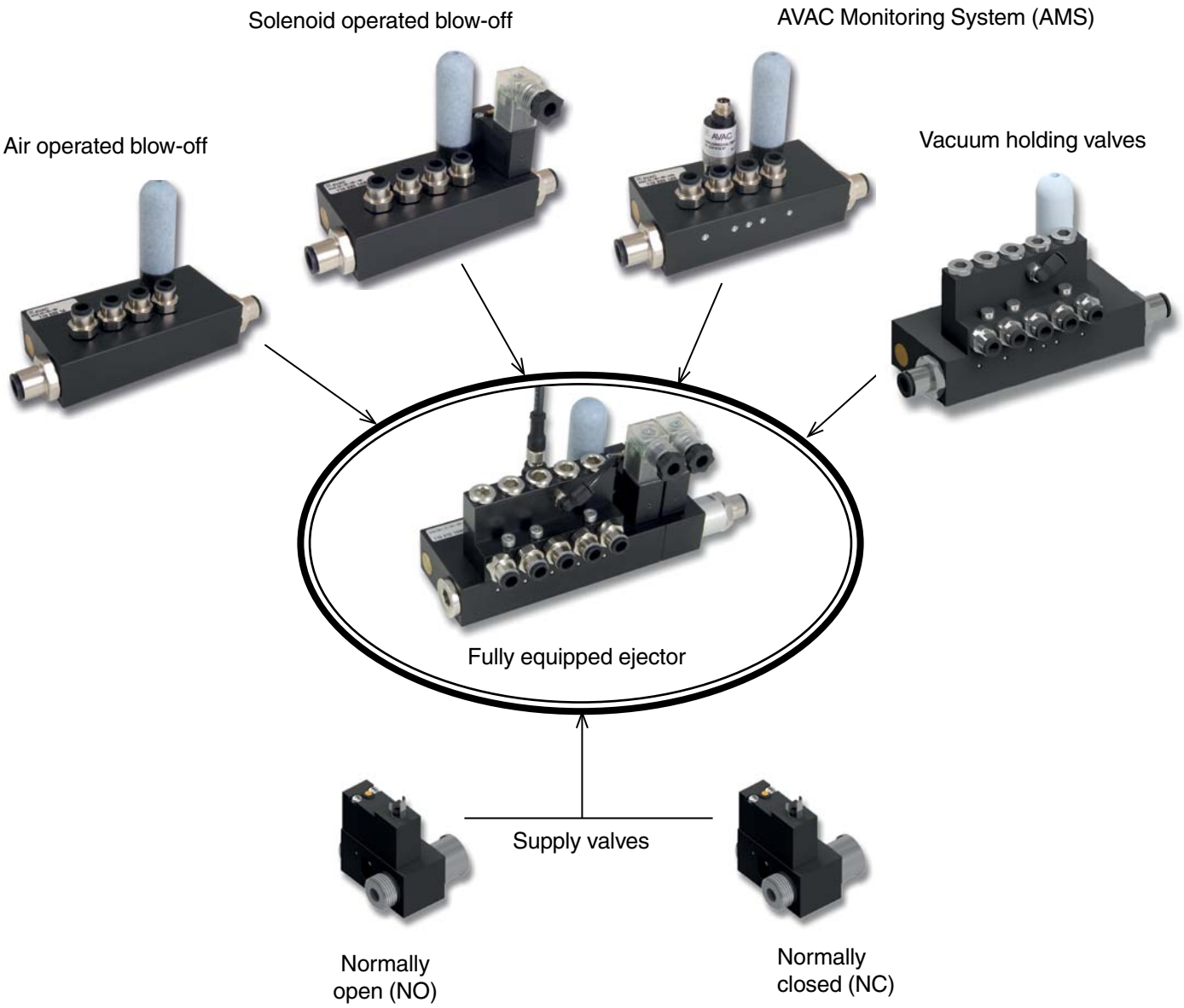
MULTI Supply valves

Normally open (NO)
See page 16



Normally closed (NC)
See page 16

Configuration options



General technical data for MULTI-CIRCUIT Ejectors

Nozzle/ Size	Primary nozzle(s) Ø mm	Air consumption Nl/min.	Evacuation time (s)*	Vacuum flow at different vacuum level [Nl/min]								
				0%	10%	20%	30%	40%	50%	60%	70%	80%
10	0,50	10	18	7,5	6,5	5,5	4,0	2,5	1,0	0,8	0,5	0,3
20	0,70	20	9	14,2	12,5	9,8	6,5	4,0	3,0	2,0	0,9	0,5
30	0,85	30	6	22,0	19,5	16,5	13,0	9,5	6,0	3,5	1,5	1,0

* Time to evacuate 1 litre air from atmospheric pressure to 75% vacuum.

Ordering key

1	1	0	0	1	0	1	4	M	S	B	C

Code	Primary nozzle(s) Ø mm
010	0,50
020	0,70
030	0,85

Code	No of circuits
14	4
15	5
16	6
18	8

Code	Performance
	Air operated blow-off
M	Solenoid operated blow-off
S	AVAC Monitoring System (AMS)
B	Equipped with vacuum holding valves
C	Supply valve normally closed NC
O	Supply valve normally open NO

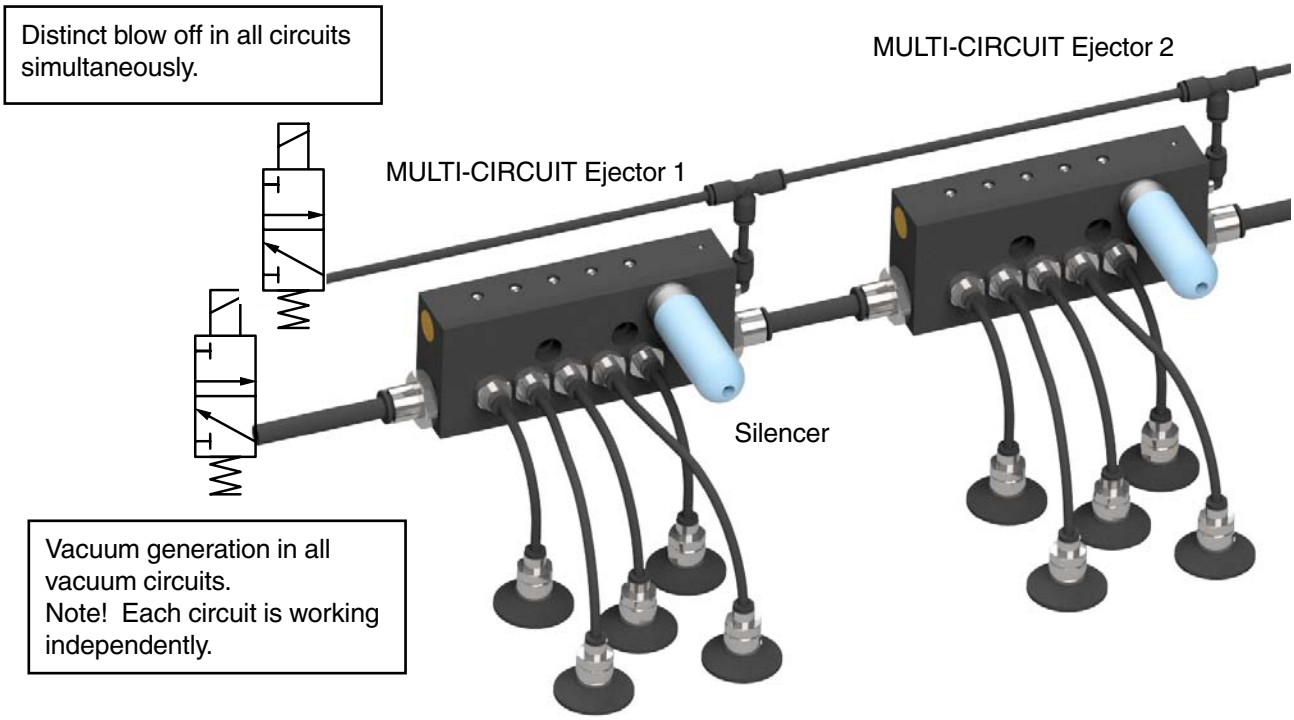
Example

MULTI-CICUIT Ejector with ordering key **110 010 14 MSBC** is equipped with:

Bas:
010 = Primary nozzles Ø0,5 mm
14 = 4 circuits
M = Solenoid operated blow-off
S = AVAC Monitoring System AMS
B = Equipped with vacuum holding valves
C = Supply valve, NC

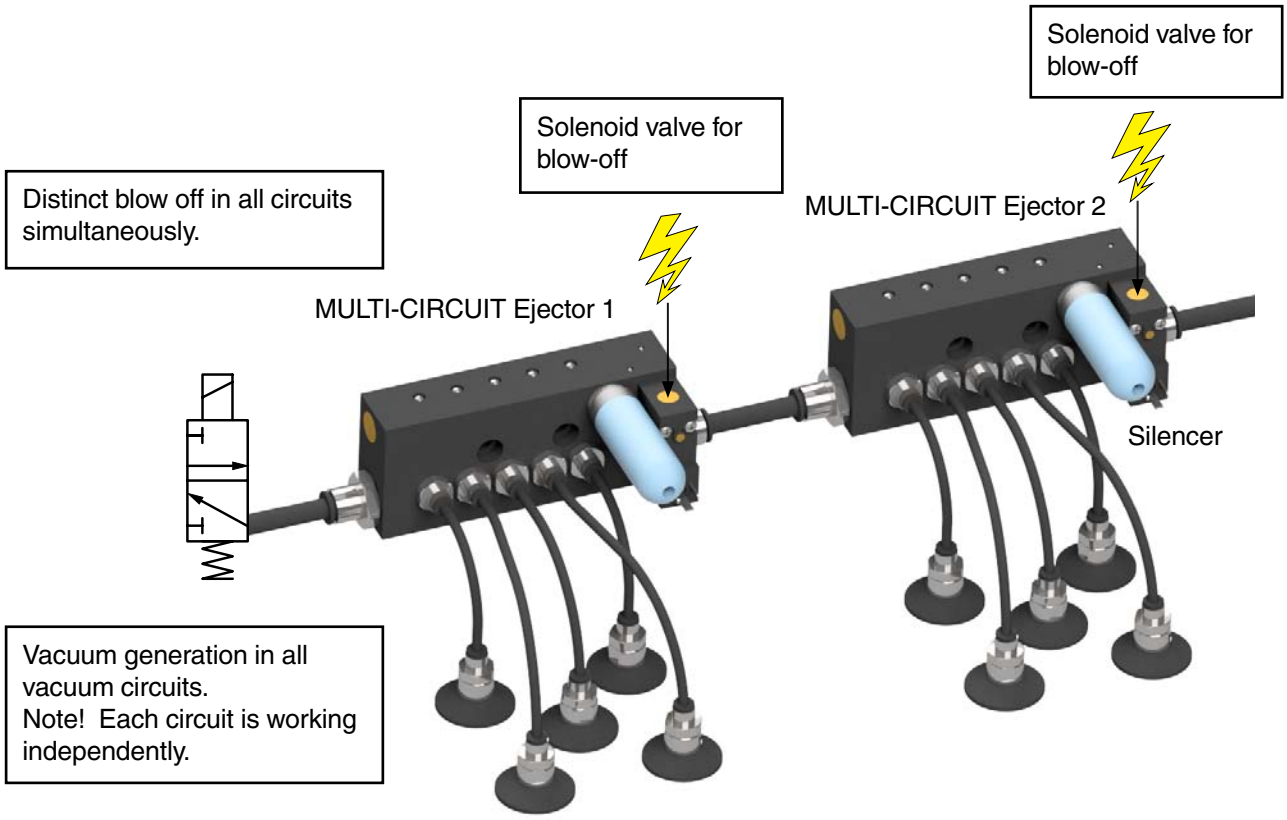
The ejector is delivered without fittings and silencers

MULTI-CIRCUIT Ejector with air operated blow-off

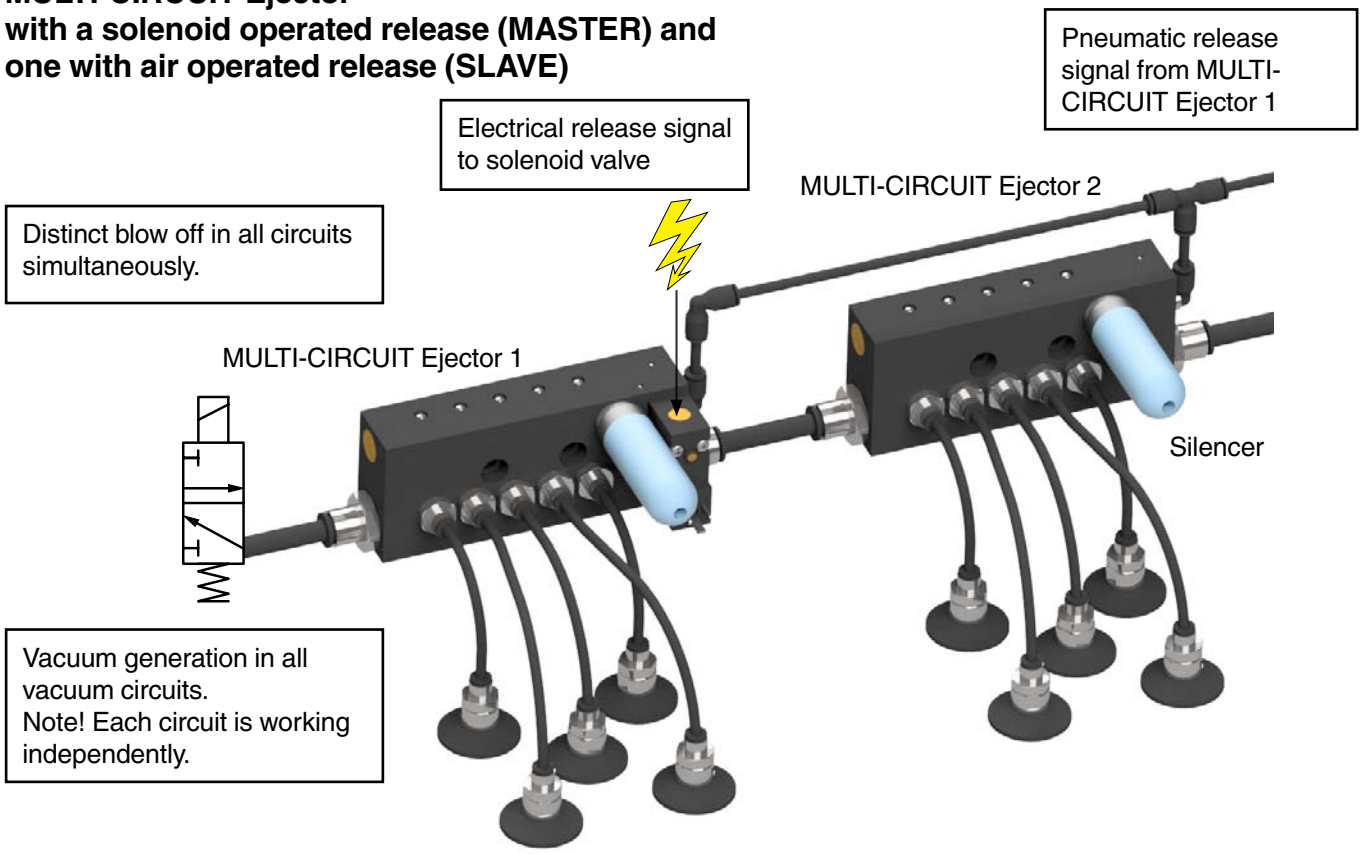


Installation in machines
The distance between the MULTI-CIRCUIT Ejectors and the volume in hoses and fittings influences the reaction time of the blow-off.

MULTI-CIRCUIT Ejector with solenoid operated release



MULTI-CIRCUIT Ejector with a solenoid operated release (MASTER) and one with air operated release (SLAVE)



Also applies to remaining MULTI-CIRCUIT Ejectors

Example of saving potential of components and work

Installation of MULTI-CIRCUIT Ejectors with solenoid operated blow-off and AVAC Monitoring System (AMS)

AMS

4 or 26

Products to be purchased, mounted and connected.

Reduced Costs

- Fewer Sensors
- Fewer system inputs
- Simplified installation
- Fewer fittings
- Fewer cables
- Simplified maintenance

Traditional installation of ejectors and vacuum sensors.

MULTI-CIRCUIT Ejectors 4K, 5K, 6K and 8K

With independent vacuum circuits & common blow off

- > 85% vacuum at 4,5 bar
- Very compact
- Low weight
- Quick response
- Controlled Rapid Release (RR)
- Robust
- Easy mounting
- Good overview as it is centrally mounted
- Greater safety as the vacuum circuits are completely separated from each other

Ejectors with 4, 5, 6 or 8 separate vacuum circuits. The circuits operate independently of each other so that the vacuum level of each circuit is secured even if the other circuits do not have contact with the object or the suction cup leaks.

The built-in blow off function (RR) releases objects distinctly in all circuits simultaneously.

Applications

Suitable for lifting with several suction cups where one or more suction cup may not be covered at times depending on the size and shape of the object being lifted, e.g. lifting of cans, where occasionally a can is missing.

Also suitable to use when a central location of all ejectors is preferred.

Multiple Assembly

The ejector also serves as a distribution block. Multiple devices can be connected in series, which simplifies assembly and installation with reduced cost and improved visibility as results.

See Ordering key on page 3

Patented Blow-off function

The ejector has an integrated Rapid Release function to ensure the object is released fast, distinct and in the right position
The response time is very short thanks to that the air supply for creating vacuum is reversed to create the release signal, this is controlled with a pilot signal in the RR connection.

Materials

Body	Black anodized aluminium
Nozzles	Brass
Piston	Acetal

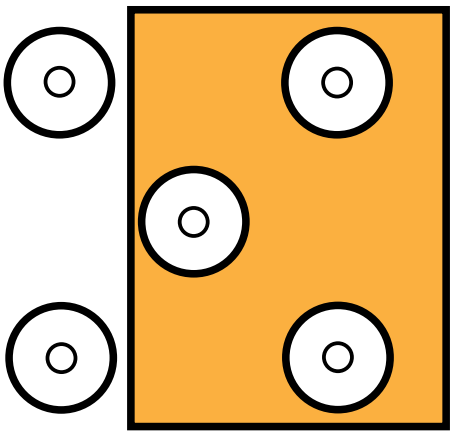
Temperature

Temperature range	-10 to +70 ˚C

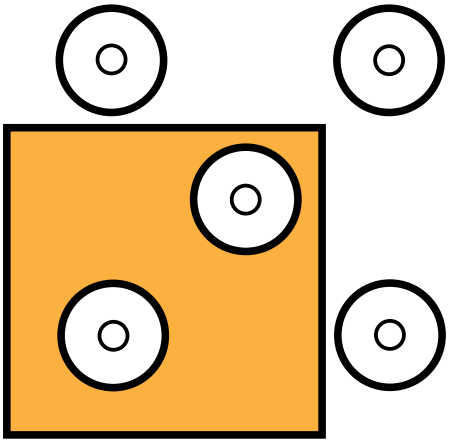
Compressed air

Pressure	max 8 bar
Optimum supply pressure	4.5 to 5 bar

5 suction cups with independent circuits, to handle objects with different shape.

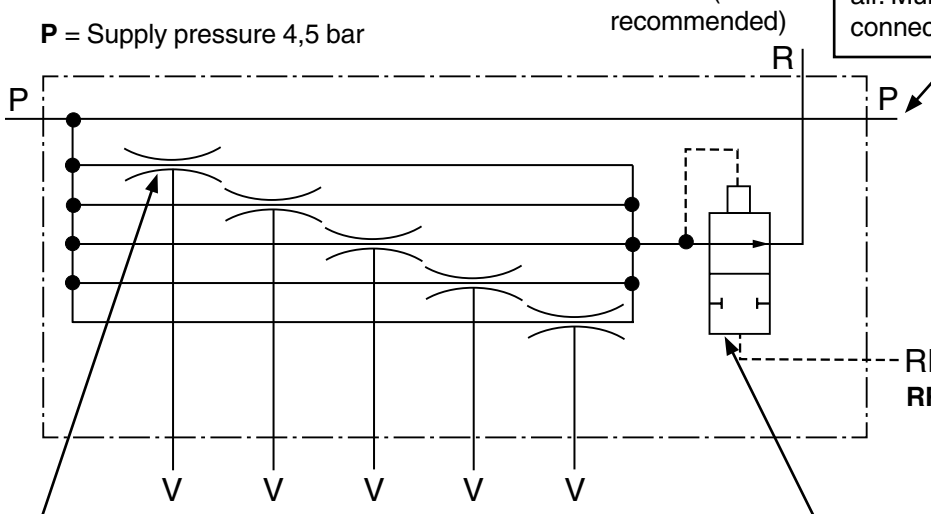


Case 1: With 2 of 5 suction cups without contact with the object, it may be lifted as long as the total lifting force is sufficient.



Case 2: With 3 of 5 suction cups without contact with the object, it may be lifted as long as the total lifting force is sufficient.

MULTI-CIRCUIT Ejector with air operated blow-off

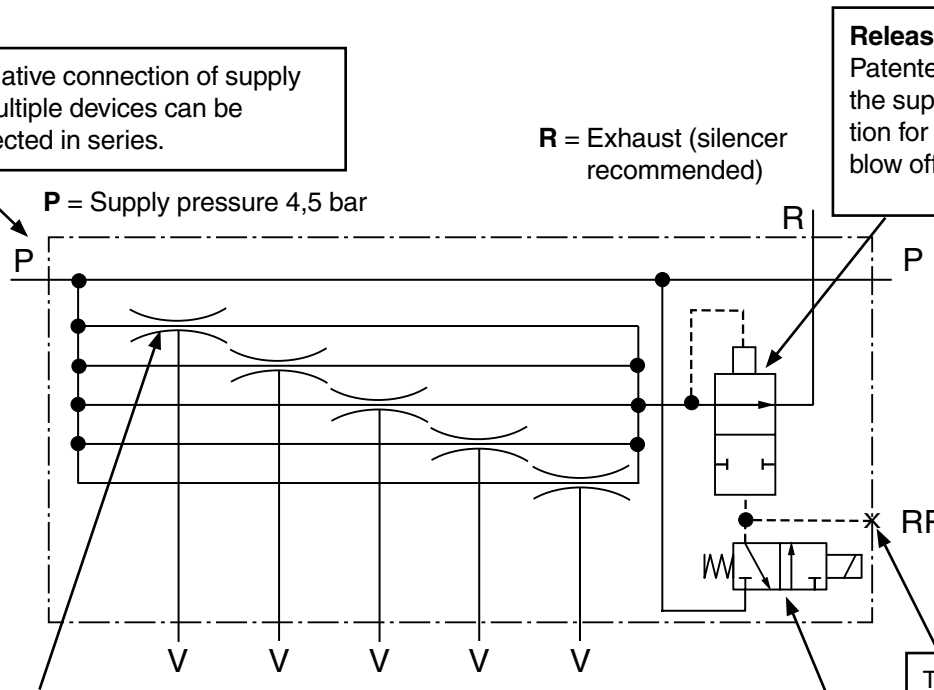


Ejectors
4, 5, 6 or 8 individual circuits enable lifting of objects with different shape without contact to all suction cups.

One suction cup without contact with the object has no influence on the other circuits.

Release function
Patented release function reverses the supply air for vacuum generation for a distinct and simultaneous blow off in all vacuum circuits.

MULTI-CIRCUIT Ejector with solenoid operated blow-off



Ejectors
4, 5, 6 or 8 individual circuits enable lifting of objects with different shapes without contact to all suction cups.

One suction cup without contact with the object has no influence on the other circuits.

Equipped with AVAC Monitoring System (AMS)

AMS

One digital or analog sensor monitors all vacuum circuits

This version has the same features as the other versions and the AMS system makes it possible to monitor all vacuum circuits with just one digital or analog vacuum sensor.

The Multi-Circuit Ejectors with AMS is patented by AVAC.

The AMS system offers the following advantages

- One single vacuum sensor (digital or analog) monitors all vacuum circuits.
- Means a significantly lower cost for vacuum sensors and installation.
- Fewer inputs on the controller reduce the component and programming costs.
- Enables predictive maintenance in case of a system leakage.

The vacuum level in the sensor port reflects the vacuum level in the suction cups including those without contact with the object. (See chart on page 11).

Example

All suction cups in contact with the object

A MULTI-CIRCUIT Ejector with 6 circuits and with all suction cups in contact with the object, the sensor will reflect the vacuum level in all circuits.

The actual value is in this case is 85% vacuum, meaning full lifting capacity.

With 5 of 6 suction cups in contact with the object

If only five of the circuits are engaged and the sixth is not in contact and thus no vacuum, the sensor will indicate a vacuum level of 72 %.

As described above, all suction cups are engaged and thus lifting may be started when 72% vacuum is passed if the lifting force is sufficient.

Innovation prize "Award for Blechexpo"

AVAC MULTI-CIRCUIT Ejector AMS was appointed the most innovative product in category Handling technology/robotics at the Blechexpo 2017 in Stuttgart, the international trade fair for sheet metal working.

See Ordering key on page 3

Note

If the vacuum level gradually drops it may indicate a system leakage which should be taken care of.

Irregular objects can be identified by a strategic positioning of the suction cups.

Sensor must be ordered separate

Digital vacuum sensor

- The sensor monitors the vacuum level in all circuits
- E.g. one suction cup without contact means no feedback signal
- Feedback, released object

Analog vacuum sensor

- The sensor monitors the vacuum level in all circuits
- Indicates number of suction cups in contact with the object/s
- Useful with different shapes of objects
  – Expected suction cups in contact
  – Recognizing object shape
- Feedback, released object

MULTI-CIRCUIT Ejector with air operated blow-off

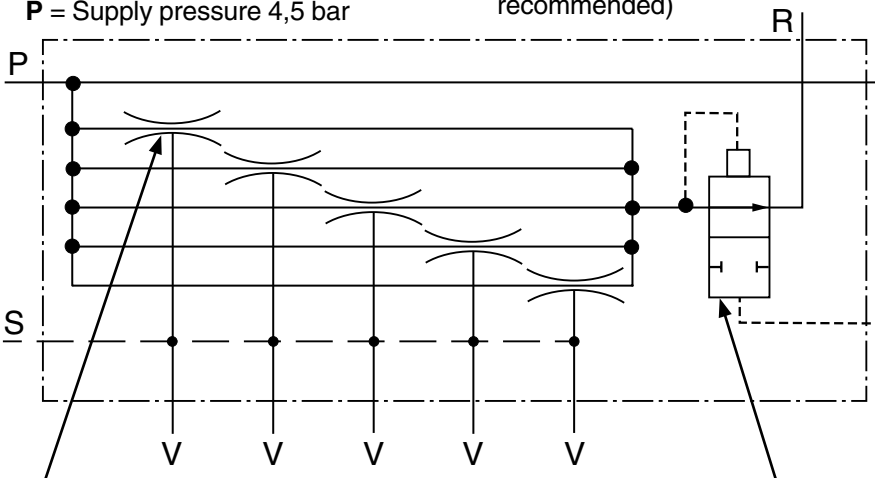
Equipped with AVAC Monitoring System (AMS)

AMS

Alternative connection of supply air. Multiple devices can be connected in series.

R = Exhaust (silencer recommended)

P = Supply pressure 4,5 bar



S = Sensor connection AMS

RR = Release signal

Ejectors
4, 5, 6 or 8 individual circuits enable lifting of objects with different shape without contact to all suction cups.

One suction cup without contact with the object has only marginal influence on the other circuits.
(Only for the AMS version)

Release function
Patented release function reverses the supply air for vacuum generation for a distinct and simultaneous blow off in all vacuum circuits.

MULTI-CIRCUIT Ejector with solenoid operated blow-off

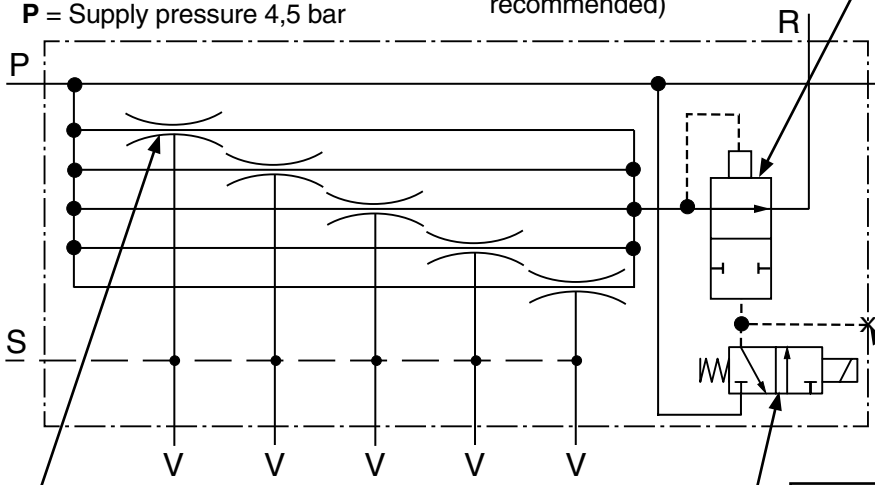
Equipped with AVAC Monitoring System (AMS)

Release function
Patented release function reverses the supply air for vacuum generation for a distinct and simultaneous blow off in all vacuum circuits.

Alternative connection of supply air. Multiple devices can be connected in series.

R = Exhaust (silencer recommended)

P = Supply pressure 4,5 bar



S = Sensor connection AMS

RR = Release signal

Ejectors
4, 5, 6 or 8 individual circuits enable lifting of objects with different shapes without contact to all suction cups.

One suction cup without contact with the object has only marginal influence on the other circuits.
(Only for the AMS version)

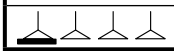
The RR-connection is plugged. By removing the plug several units can be connected to the blow-off signal.

Solenoid operated release function

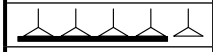
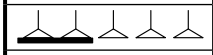
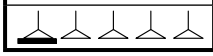
Charts for vacuum values in the sensor port as a function of the number of suction cups engaged/open and ejector capacity 85%.

AMS

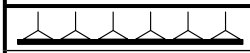
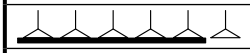
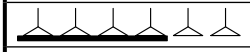
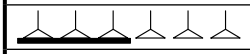
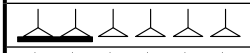
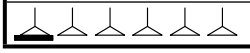
Vacuum level in Multi Circuit Ejector 4K with AMS

	Circuit				Measured value in sensor port S
	1	2	3	4	
	85%	85%	85%	85%	85%
	81%	81%	81%	0%	60%
	80%	80%	0%	0%	21%
	78%	0%	0%	0%	4%

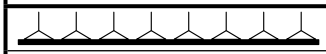
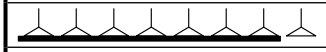
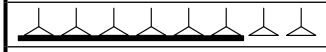
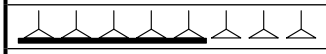
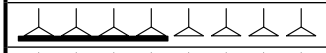
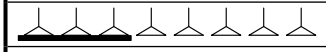
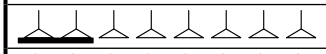
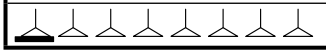
Vacuum level in Multi Circuit Ejector 5K with AMS

	Circuit					Measured value in sensor port S
	1	2	3	4	5	
	85%	85%	85%	85%	85%	85%
	82%	82%	82%	82%	0%	68%
	80%	80%	80%	0%	0%	34%
	78%	78%	0%	0%	0%	13%
	76%	0%	0%	0%	0%	2%

Vacuum level in Multi Circuit Ejector 6K with AMS

	Circuit						Measured value in sensor port S
	1	2	3	4	5	6	
	85%	85%	85%	85%	85%	85%	85%
	82%	82%	82%	82%	82%	0%	72%
	80%	80%	80%	80%	0%	0%	47%
	78%	78%	78%	0%	0%	0%	21%
	76%	76%	0%	0%	0%	0%	8%
	75%	0%	0%	0%	0%	0%	1%

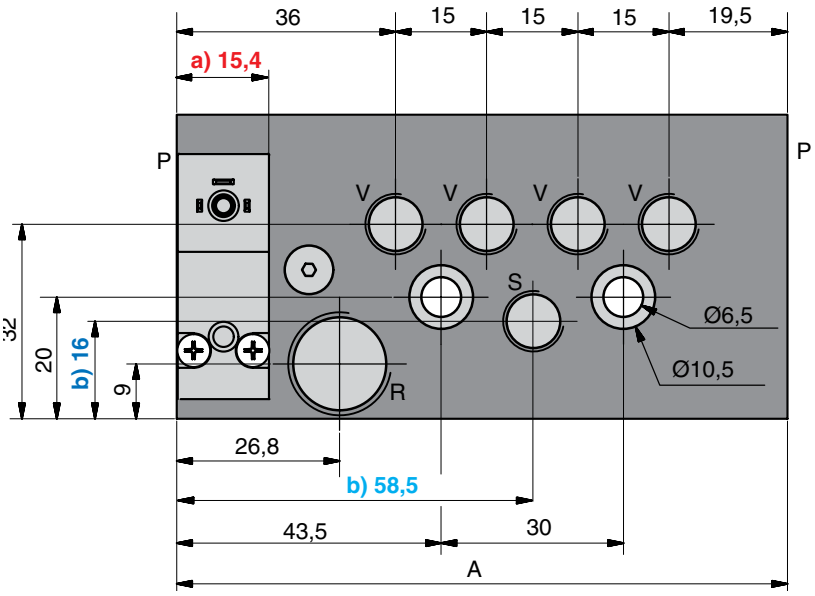
Vacuum level in Multi Circuit Ejector 8K with AMS

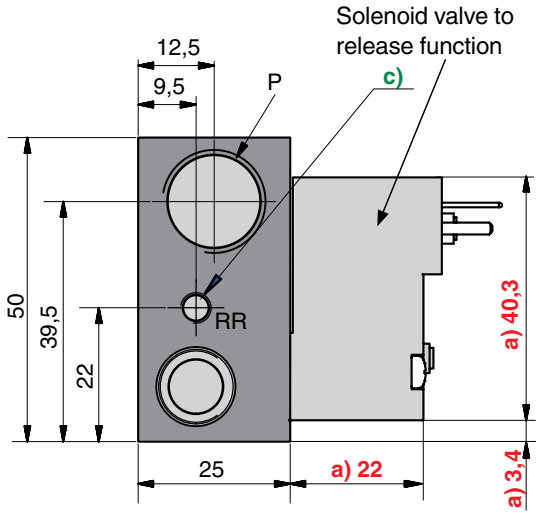
	Circuit								Measured value in sensor port S
	1	2	3	4	5	6	7	8	
	85%	85%	85%	85%	85%	85%	85%	85%	85%
	84%	84%	84%	84%	84%	84%	84%	0%	78%
	84%	84%	84%	84%	84%	84%	0%	0%	63%
	83%	83%	83%	83%	83%	0%	0%	0%	43%
	82%	82%	82%	82%	0%	0%	0%	0%	22%
	81%	81%	81%	0%	0%	0%	0%	0%	10%
	81%	81%	0%	0%	0%	0%	0%	0%	4%
	80%	0%	0%	0%	0%	0%	0%	0%	1%

Vacuum levels in the charts are theoretical. The actual values depend on the volume, restrictions and potential leaks in the vacuum circuit. The actual values in the application should be measured so that the sensor can be adjusted accordingly.

Dimension

MULTI-CIRCUIT Ejector without Vacuum holding valves





a) Valid for version "M" only
b) Valid for version "S" only
c) RR connection plugged on version "M"

P = Air connection
V = Vacuum connection
R = Exhaust
S = Sensor connection
RR = Blow off (Rapid Release)

3D CAD FILES (STEP)
Download via:
http://www.avac.se/en

General technical data for MULTI-CIRCUIT Ejectors

Nozzle/ Size	Primary nozzle(s) Ø mm	Air consumption Nl/min.	Evacuation time (s)*	Vacuum flow at different vacuum level [Nl/min]								
				0%	10%	20%	30%	40%	50%	60%	70%	80%
10	0,50	10	18	7,5	6,5	5,5	4,0	2,5	1,0	0,8	0,5	0,3
20	0,70	20	9	14,2	12,5	9,8	6,5	4,0	3,0	2,0	0,9	0,5
30	0,85	30	6	22,0	19,5	16,5	13,0	9,5	6,0	3,5	1,5	1,0

* Time to evacuate 1 litre air from atmospheric pressure to 75% vacuum.

No of circuits	A [mm]	Connecting threads				Weight [g]	Tilläggsvikt för utförande [g]			
		P	V	R	RR	Standard and "S"	"M"	"B"	"C"	"O"
4	101	2xG3/8	4xG1/8	G3/8	M5	290	+40	+80	+120	+120
5	116		5xG1/8			330	+40	+100	+120	+120
6	131		6xG1/8			370	+40	+120	+120	+120
8	161		8xG1/8			450	+40	+120	+120	+120

Code	Performance
	Air operated blow-off
M	Solenoid operated blow-off
S	AVAC Monitoring System (AMS)
B	Equipped with vacuum holding valves
C	Supply valve normally closed NC
O	Supply valve normally open NO

Operating Instructions
http://www.avac.se/pdfi/I-MULTI.pdf

MULTI-CIRCUIT Ejector with vacuum holding valves

Increased safety

This version has all the advantages of the MULTI-CIRCUIT Ejector. Additionally, each vacuum circuit has a separate built-in vacuum holding valve.

As long as the ejector generates vacuum the vacuum holdings valves are open. At loss of inlet pressure which interrupts the vacuum generation, the vacuum holding valves close between the ejector and the suction cup. It means that the vacuum in the suction cups remains until system leakage reduces the vacuum level.

At blow-off mode, a common signal is given to all vacuum holding valves to open simultaneously. This results in a system with quick response and with excellent visibility.

Reduced air consumption

An example how to save considerable amount of compressed air, this require an external control system and sensor in the AMS port.

As the sensor in the AMS port provides an output signal when all vacuum circuits have reached the pre-set vacuum level, the vacuum generation can be switched off, resulting in that all vacuum holding valves are closing.
The vacuum level in the suction cups is thus maintained, but in the event of a system leakage, the vacuum level will gradually decrease in the concerned circuit.

Since the sensor does not continuously monitor the vacuum level, the vacuum generation must be restarted to monitor the actual vacuum level in the suction cups. If the system is air tight, such a check takes less than 50ms which makes the air consumption for this almost negligible. How often this check should be made depends on the safety requirements for the specific application.

The vacuum level in the circuits are monitored via the AMS-sensor, and at each check, the vacuum generation restarts which restores the vacuum level to the pre-set level.

If the time to restore the vacuum level has increased more than expected, the cause of the leakage should be investigated. Before the leakage has been rectified a more frequent check of the vacuum level should be initiated.
Alternatively, a switch to continuous vacuum generation could be made.

Example

Gripping

6 cans should be lifted and placed in a cardboard box. Before lifting, vacuum is generated in all circuits and when the pre-set vacuum level is reached, the vacuum generation is switch off and lifting can start.

Occasional checks

If required, instantaneous checks of the vacuum level can be made during the course of the lift.
The signal value in the AMS port indicates if all suction cups are in contact with the cans. If the signal value deviates, this indicates a system leakage or suction cup without contact.
To ensure that all cans are in position before unloading, a final control of the AMS value can be made by restarting the vacuum generation.

Release

To release the cans, a blow-off signal is given which opens all vacuum holding valves and releases the cans.

Picture of a MULTI-CIRCUIT Ejector with solenoid valve operated blow-out and AVAC Monitoring System (AMS) equipped both with MULTI Supply valve and Vacuum Holding valves.

See Ordering key on page 3

Materials

Body:	Black anodized aluminium
Banjo screw:	Anodized aluminium
Piston:	Aluminium
Seals:	Nitril rubber NBR

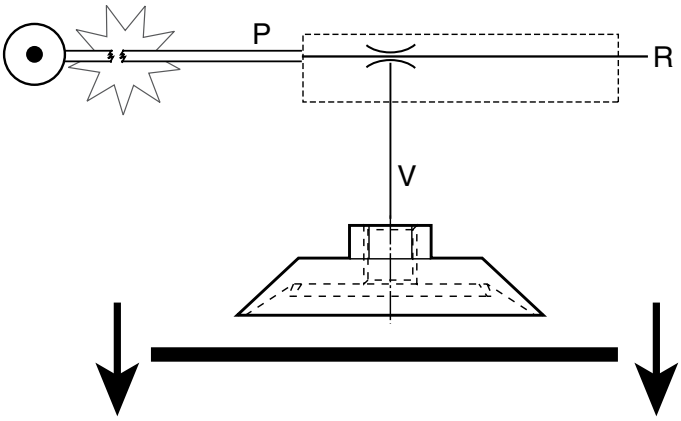
Temperature

Temperature range:	0 to +50 ˚C

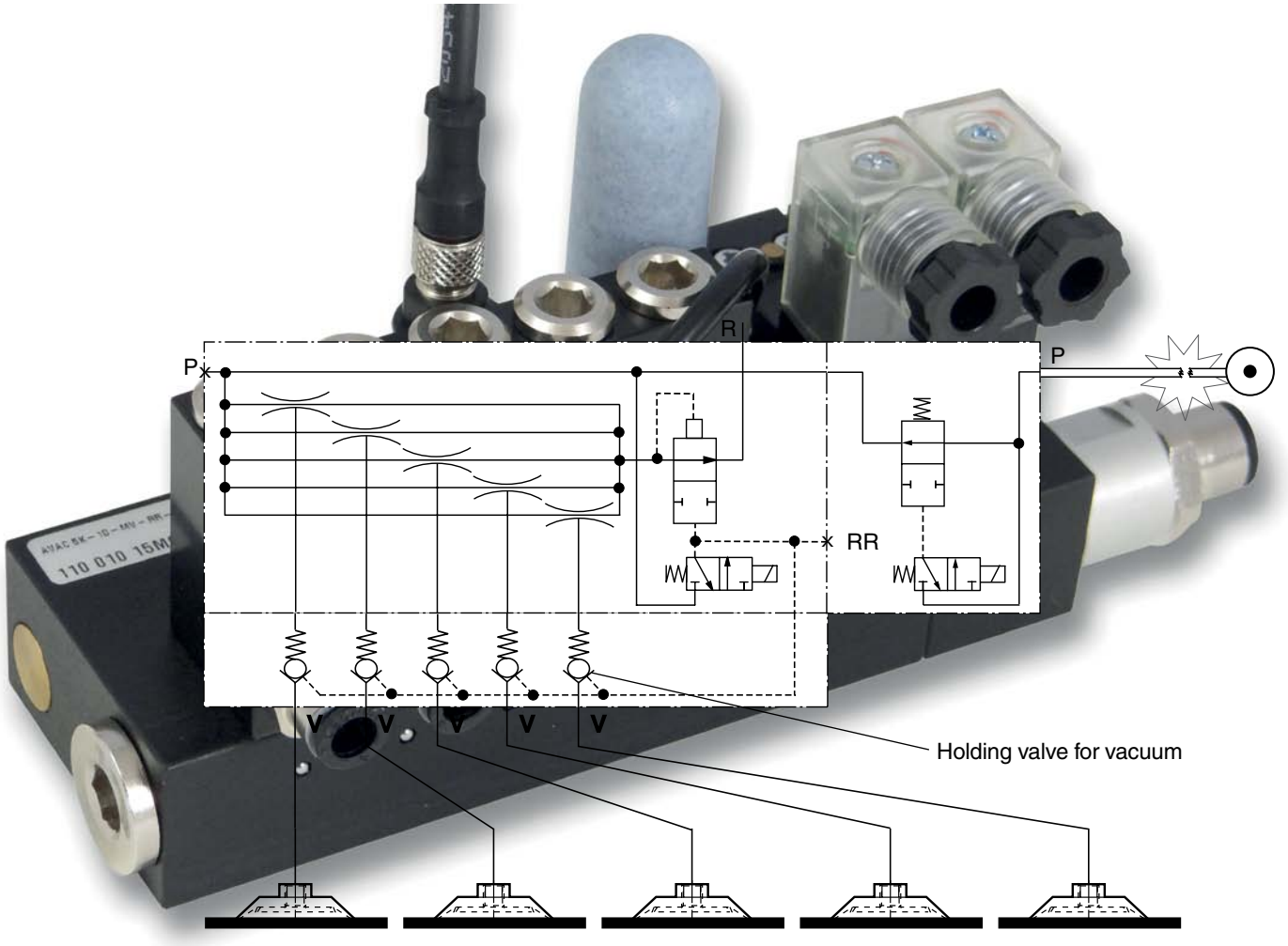
Compressed air

Max pressure:	8 bar
Optimal pressure:	4.5 to 5 bar

Holding valve means increased safety



Vacuum is generated when the ejector is supplied with air. If the air supply would be interrupted by e.g., a compressor failure, a malfunctioning valve or a loose connection, the vacuum will not be maintained as atmospheric pressure leaks into the suction cup, causing an unforeseen drop of the object.



An ejector equipped with a holding valve prevents the atmospheric pressure from leaking through the vacuum port into the vacuum area.

This is how the holding valve works:
When the ejector is operating, the holding valve is opens and air can be evacuated from the suction cup.

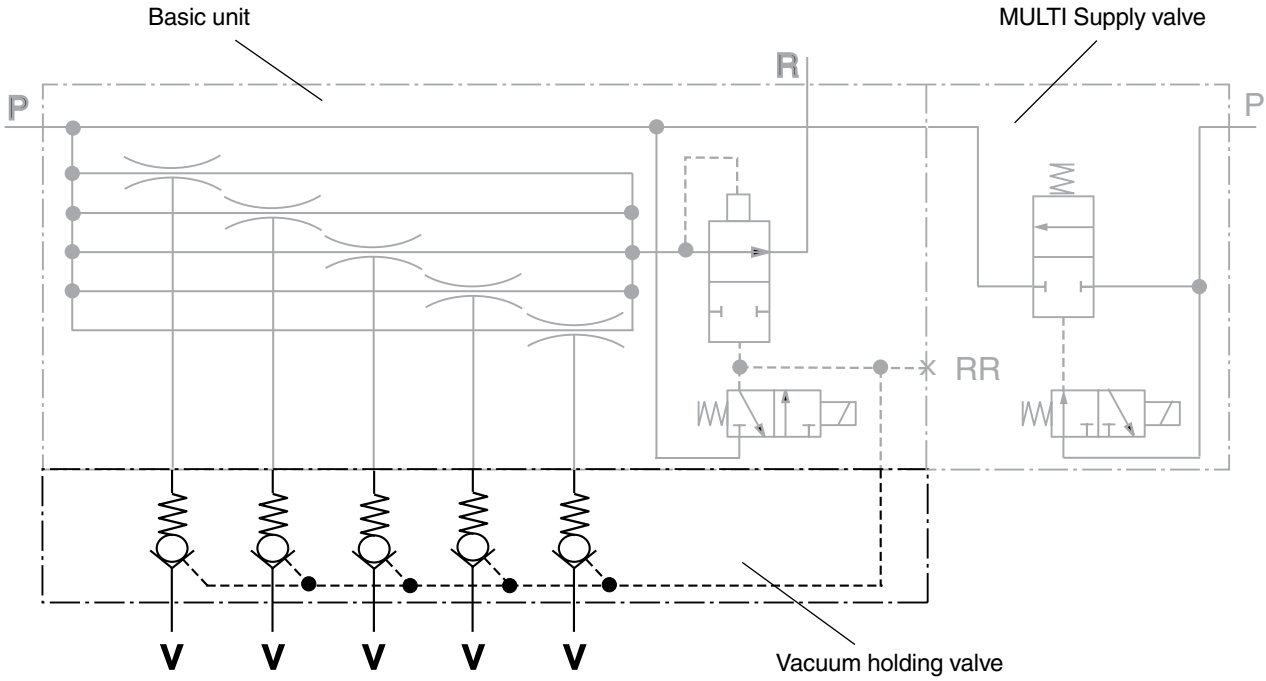
When vacuum is not created, the valve is closed. The leakage in the vacuum circuit, reduces the vacuum level gradually. How long it will take until the object is dropped depends on the leakage flow.

The holding valve is mainly used in applications where air tight materials are handled e.g. plastic, metal or glass.

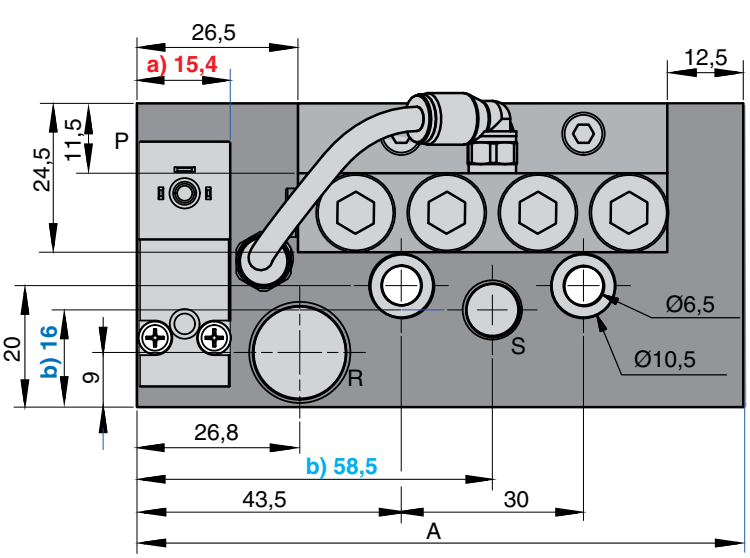
As the vacuum holding valve is maintaining the vacuum level, a blow-off function is required to release the object rapidly and with accuracy.

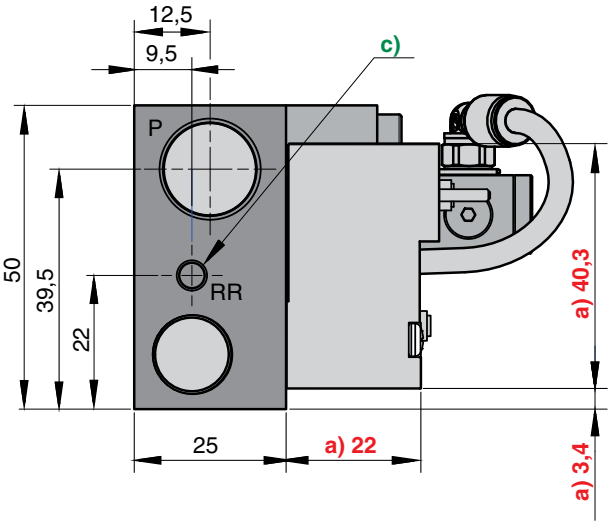
NOTE: The holding valve cannot be regarded as a safety product, but to be considered as a possibility to extend the time until the object is dropped.

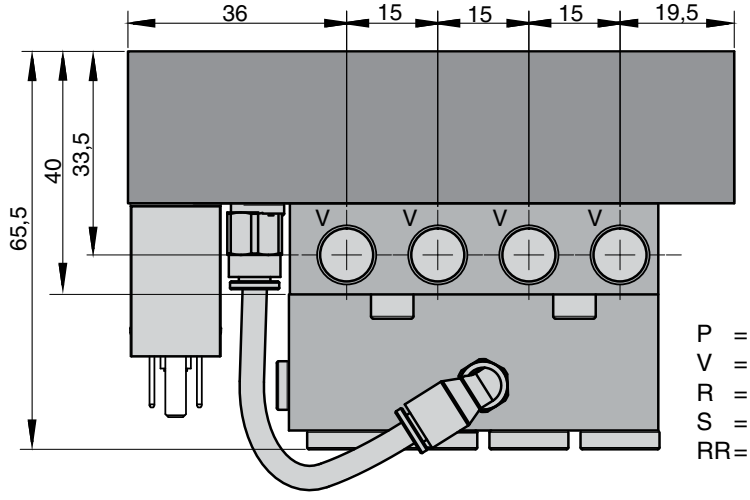
MULTI-CIRCUIT Ejector with Vacuum holding valves



Dimension



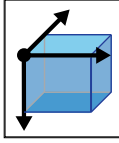




a) Valid for version "M" only
b) Valid for version "S" only
c) RR connection plugged on version "M"

Code	Performance
	Air operated blow-off
M	Solenoid operated blow-off
S	AVAC Monitoring System (AMS)
B	Equipped with vacuum holding valves
C	Supply valve normally closed NC
O	Supply valve normally open NO

P = Air connection
V = Vacuum connection
R = Exhaust
S = Sensor connection
RR = Blow off (Rapid Release)

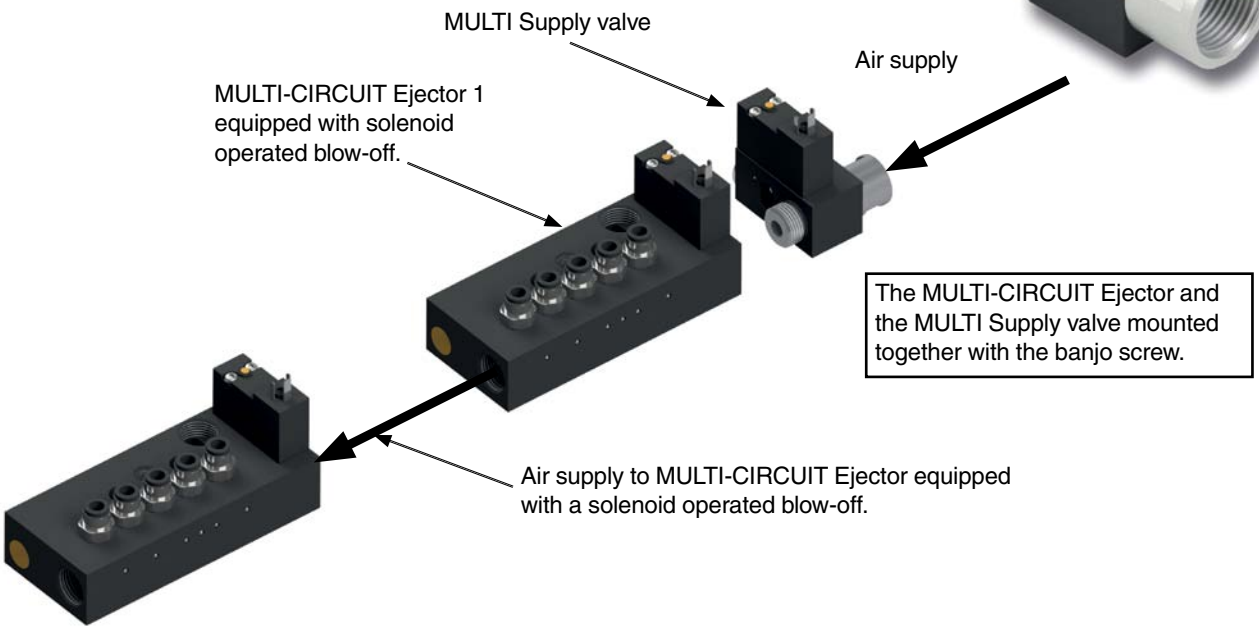


3D CAD-filer (STEP)
Ladda ner via:
http://www.avac.se/en

MULTI Supply valve NC or NO

Simplified assembly for a stand-alone MULTI-CIRCUIT Ejector or to feed a limited number of ejectors results in an improved overview.

Versions equipped with Normally Open (NO) solenoid valve can increase safety as long as the air supply exists, even if an electrical power failure to the solenoid valve occurs.



The MULTI-CIRCUIT Ejector and the MULTI Supply valve mounted together with the banjo screw.

The solenoid operated supply valve can easily be mounted with the banjo screw in the supply port of the ejector. The air flow of the valve is sufficient to supply an number of ejectors in serie and is only intended to be used in combination with solenoid operated blow-off

NOTE!
The MULTI Supply valve is only intended to use in combination with MULTI-CIRCUIT Ejectors with solenoid operated blow-off.

See Ordering key on page 3

Materials

Body:	Black anodized aluminium
Banjo screw:	Anodized aluminium
Piston:	Aluminium
Seals:	Nitril rubber NBR

Temperature

Temperature range:	0 to +50 ˚C

Compressed air

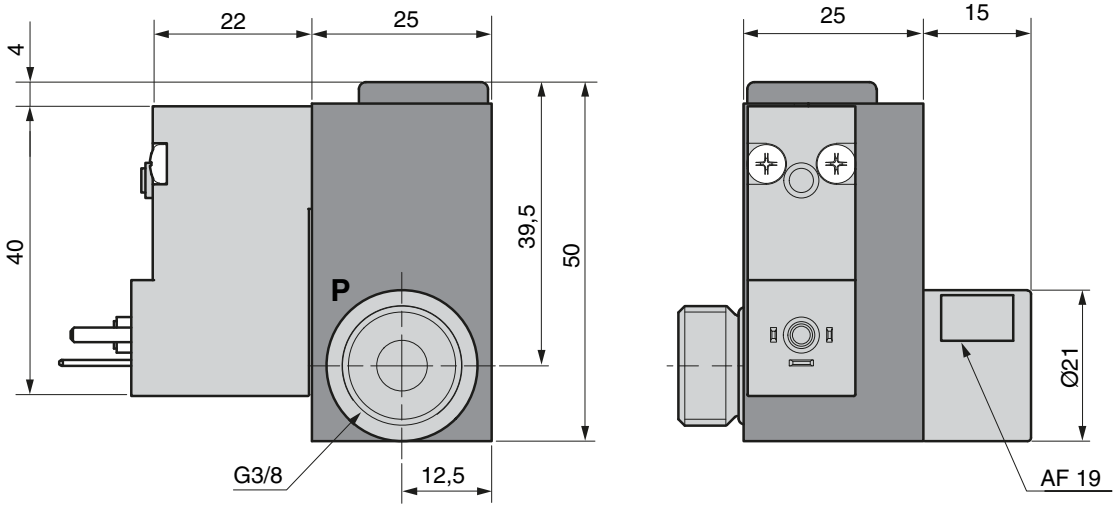
Max pressure:	8 bar
Optimal pressure:	5,5 bar

Flow capacity:

Flow capacity: 240 Nl/min at ΔP 1bar.
Sufficient to supply air to:
24 nozzles size 10,
12 nozzles size 20,
8 nozzles size 30,
Or a mix of nozzle sizes to a maximum of 240

Designation	Weight g	Order no.
MULTI Supply valve NC	**120**	**482 000 00**
MULTI Supply valve NO	**120**	**482 000 01**

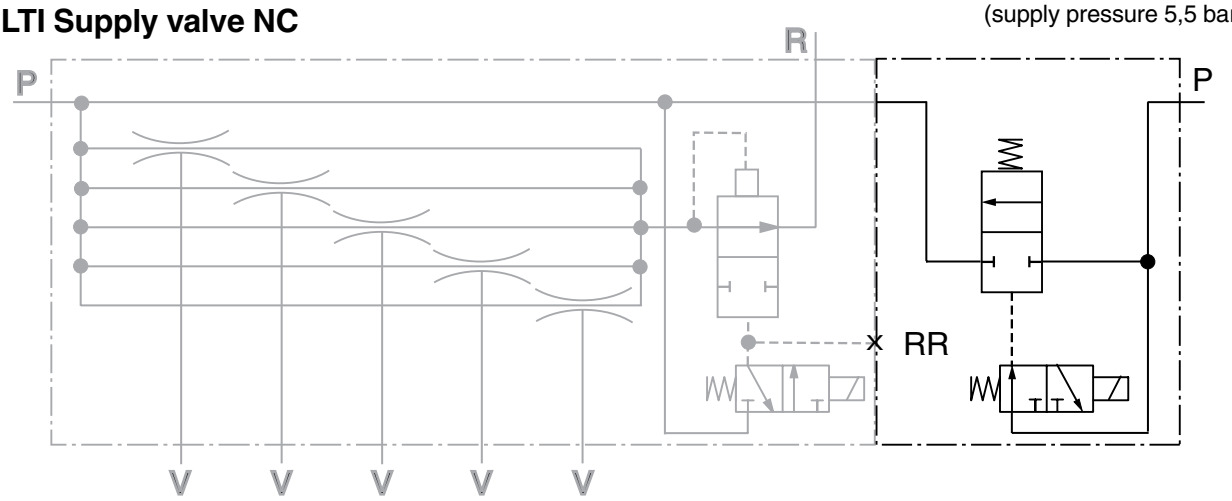
MULTI Supply valve



3D CAD FILES (STEP)
Download via:
http://www.avac.se/en

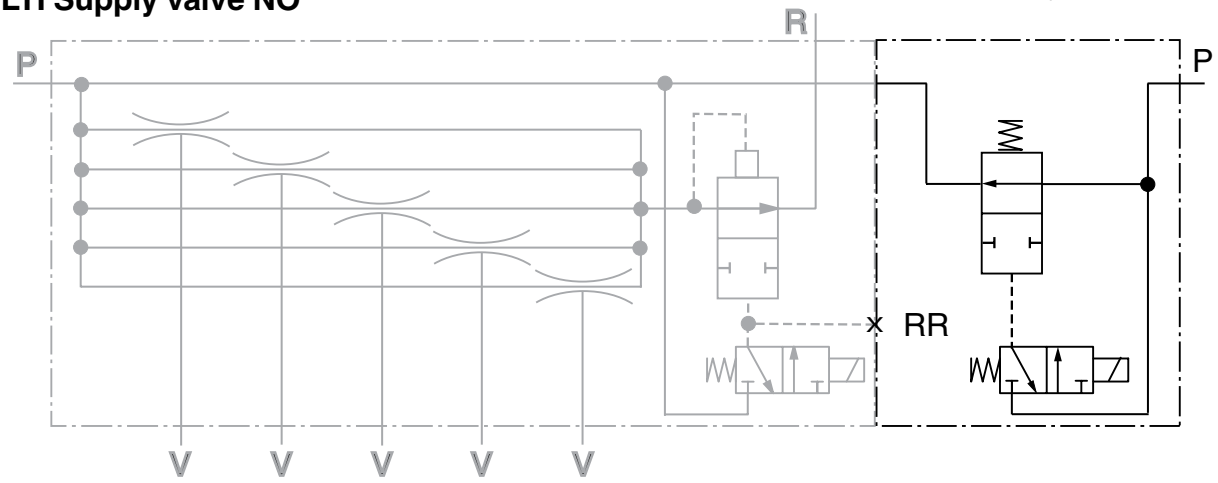
MULTI Supply valve NC

P=Main air supply connection (supply pressure 5,5 bar).



MULTI Supply valve NO

P=Main air supply connection (supply pressure 5,5 bar).



Evacuation and Blow-off time per circuit for suction cup volumes.

In practice

	Multi-Circuit-Ejectors with supply pressure 5 bar			
				
	Flat cup Ø30 mm Volume 1,7 cm³	Flat cup Ø50 mm Volume 7 cm³	Flat cup Ø80 mm Volume 36 cm³	Flat cup Ø100 mm Volume 58 cm³
Time to evacuate a suction cup from 0 to 70% vacuum in ms				
Size 10 Nozzle Ø0.5 mm	21	85	436	702
Size 20 Nozzle Ø0.7 mm	12	47	238	383
Size 30 Nozzle ø0,85 mm	8	32	159	255
Blow-off time from 70% vacuum to 0 in ms				
Size 10 Nozzle Ø0.5 mm	2	9	44	70
Size 20 Nozzle Ø0.7 mm	1	5	24	38
Size 30 Nozzle ø0,85 mm	<1	3	15	23

0 = atmospheric pressure

Tubings and connectors volumes not included.

Solenoid valve

Technical data

Voltage	24 VDC
Power	1,8 W
Max. pressure	10 bar
Protection class	IP65 (with cable connector mounted)

Function	Designatio	Order no.
Blow-off	Magnetventil 24 VDC NC	505 024 11

Function	Designatio	Order no.
Supply valve NC	Solenoid valve 24 VDC	505 024 12
Supply valve NO	Solenoid valve 24 VDC	505 024 11

Cable connector according to EN175301-803,
(former DIN 43650-B), ISO 6952, to be ordered separately

Designation	Order no.
Kabelhuvud med LED och gnistsläckare	590 024 02

We recommend using the cable connector equipped with LED indicators for an easy overview and troubleshooting, and equipped with surge protection in order to both protect and provide other electrical/electronic equipment a longer lifespan.