Formula Air
Supporting your performance

FS cyclones

Rev. 1.0-2024

Content

1. Introduction

This manual cannot be reproduced, even partially, without prior written consent by Formula Air Group. Every step of the cyclone along its life cycle has been deeply analyzed by Formula Air Group in the expected area during the design, construction, and maintenance manual creation. However, it is understood that nothing can replace the experience, training and good sense of the professionals who work with the device.

Ignoring the cautions and warning from the present manual, improper use of parts or the whole device supplied, using unauthorized spare parts, manipulating the device by non-qualified personnel, violation of any safety norm regarding design, construction and use expected by the supplier, exempt Formula Air Group from all responsibility in case of damages to people or properties.

Formula Air Group does not take any responsibility for the non-observance of the user about the preventive safety measures presented in this manual.

The utilization implies compliance and knowledge of the Machine Directive 2006/42/EU.

Failure to comply with the requirements of the operating manual or incorrect use of the extraction arm during operation can lead to the damage of the cyclone and the loss of the function performed by the cyclone itself. This will result in termination of the warranty on the item and will release the manufacturer from any liability.

WARRANTY

In regards to the device's warranty, see the sales general condition in the contractual center.

ATTENTION !

Before proceeding with the installation of the cyclone, ensure that the markings on the product are compatible with the site of use. Failure to comply with this prescription can cause serious injury to persons including death and/or serious damage to property.

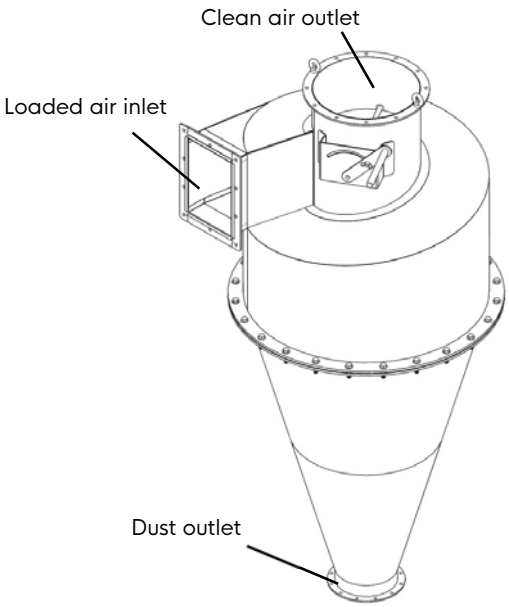
NOTE: All drawings and references contained within this manual are non-contractual and are subject to change without prior notice at the discretion of the Formula Air Group and its partners.

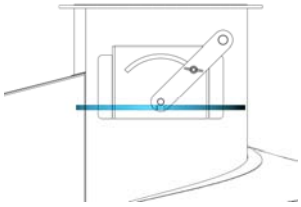
2. Product description

The cyclone is designed to separate material from air before filtration.

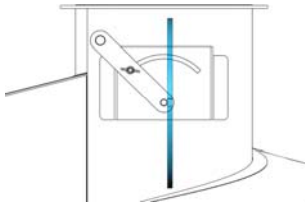
FS Cyclones are used for the separation of particles in the wood and paper industry, but also in the grain industry, and many more applications can be found. FS Cyclones are placed, in general, in all industries that do not require a high efficiency of material separation.

Manufactured in 1,25 mm galvanized sheet metal, legs and dustbin are optional and are available separately. A throttle valve is included to control the airflow. The desired position of the valve can be manually adjusted with the handle and locked in place with a butterfly nut.





THE VALVE IS CLOSED. NO AIRFLOW



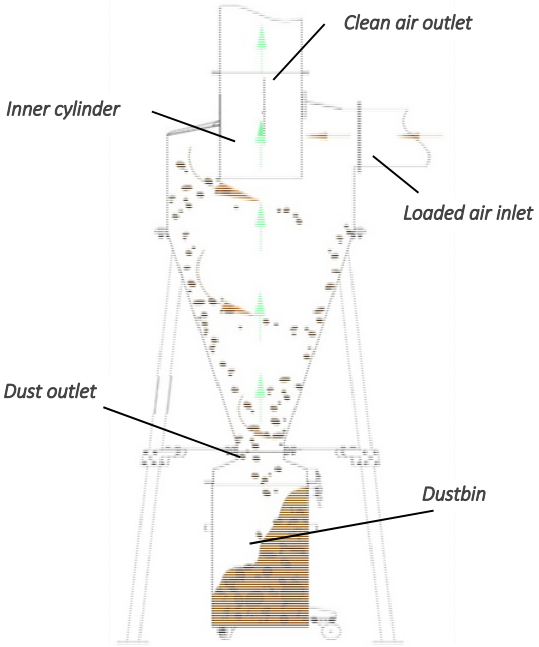
THE VALVE IS OPENED. FULL AIRFLOW

During normal operation, dust laden air enters the FS cyclone unit through the loaded air inlet.

The air and the material are diverted into a spiral motion around the inside perimeter. The centrifugal force applied by the sidewall allows the heavier material to fall out the dust outlet into the dust bin, or through a rotary valve.

Clean air is carried through the inner cylinder and discharges into the atmosphere or secondary filters.

NOTE : installing, start up and operational use are exclusively admissible after getting acquainted with the contents of the Use and Maintenance Manual.



2.2. Accessories

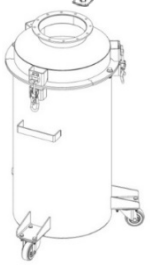
2.2.1. Supporting legs

Square galvanized profiled legs, welded to 5mm or 8mm sheet metal holders.

* For overall dimensions, please see attached tables in Chapter 2.5.

** For technical data, please see attached tables in Chapter 2.5.

2.2.2. Heavy dustbin



The heavy dustbin collects the dust or other particles from the cyclone that is subtracted from the air. It can be easily removed by opening the locks and removing the two bolts. Once removed, the dustbin can be rolled out on its integrated wheels and the contents can be emptied. The dustbin is made out of 2 mm ST37 sheet metal, powder-coated in RAL 5010.

CAUTION! The waste material must be disposed of in compliance with the national laws and/or local legislations in force.

* For overall dimensions, please see attached tables in Chapter 2.5.

** For technical data, please see attached tables in Chapter 2.5.

2.2.3. Light dustbin

The light dustbin serves the same purpose as the heavy execution. It can be easily removed by opening the lock-ring. Once removed, the dustbin can be carried away and the contents can be emptied. The dustbin is made out of 1 mm galvanized sheet metal.

CAUTION ! The waste material must be disposed of in compliance with the national laws and/or local legislations in force.

* For overall dimensions, please see attached tables in Chapter 2.5.

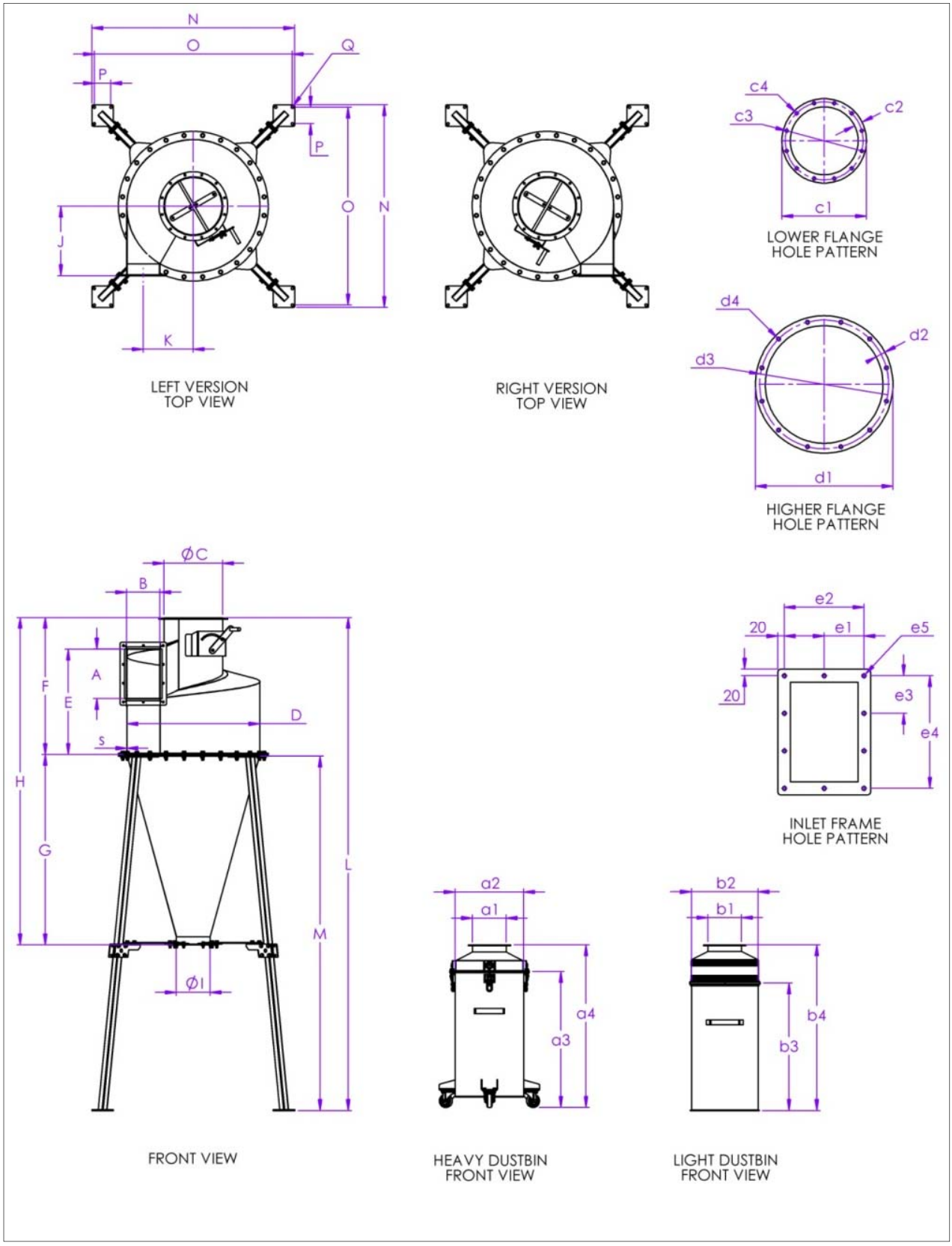
** For technical data, please see attached tables in Chapter 2.5.

2.4 Restrictions

1. Producer is not responsible for failures arising during the use that is inconsistent to the purpose of application,
2. Installing any additional elements not belonging to the normal device structure (or accessory set) is not acceptable,
3. Any structural changes or modification of the unit carried out by User on one's own are not permitted,
4. Prior to installing examine the load capacity of the structure in points where the device shall be mounted, Unsure mounting could cause hazard to personnel / people in the vicinity, as well as damage of the device itself,
5. **Do not use the device for conveying the air mixture with combustible substances, in form of gas, steams or hybrid mixing, unstable chemical substances, explosive substances, or pyrotechnic substances – that might create explosive atmosphere,**
6. Do not apply the device for conveying the air containing viscous compounds that would deposit on the surface of the device elements,
7. Do not apply the device for conveying the air containing aggressive compounds that would have destructive effect on the device elements.

2.5 Technical datasheet

2.5.1. Cyclone dimensions



Cyclone dimensions

Type	A	B	ØC	ØD	E	F	G	H	ØI	J	K	s
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
FS-3	300	200	354	803	640	830	1150	1980	200	420	302	1.25
FS-4	350	250	404	903	740	950	1130	2280	200	500	325	1.25
FS-6	400	300	454	1123	840	1080	1500	2580	250	580	411	1.25
FS-8	450	350	504	1253	950	1230	1700	2930	250	675	451	1.25
FS-11	530	400	604	1604	1130	1410	1900	3310	300	790	601	1.25
FS-16	640	480	704	1804	1350	1700	1900	3600	300	970	661	1.25
FS-20	800	500	1004	2004	1410	1750	1700	1447	400	980	750	2.00

Legs dimensions

Type	L	M	N	O	P	ØQ
	mm	mm	mm	mm	mm	mm
FS-3	2980	2140	1225	1195	100	14
FS-4	3280	2321	1330	1300	100	14
FS-6	3580	2489	1531	1501	100	14
FS-8	3930	2689	1667	1637	100	14
FS-11	4310	2889	1959	1929	100	14
FS-16	4600	2889	2170	2130	140	14
FS-20	4447	2690	2273	2233	140	14

Dust bin & flange connections

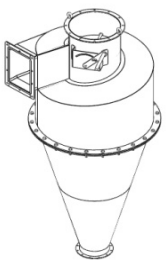
Type	Øa1	Øa2	a3	a4	Øb1	Øb2	b3	b4	Øc1	c2	Øc3	Øc4
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
FS-3	200	410	820	980	200	400	770	1000	255	25	235	9 x12
FS-4	200	410	820	980	200	400	770	1000	255	25	235	9 x12
FS-6	250	410	820	980	250	400	770	1000	305	25	285	9 x12
FS-8	250	410	820	980	250	400	770	1000	305	25	285	9 x12
FS-11	300	410	820	980	300	400	770	1000	355	25	336	9 x12
FS-16	300	410	820	980	300	400	770	1000	355	25	336	9 x12
FS-20	400	410	820	980	400	400	770	1000	465	30	439	11 x16

Type	Ød1	d2	Ød3	Ød4	e1	e2	e3	4	Øe5
	mm	mm	mm	mm	mm	mm	mm	mm	mm
FS-3	415	30	389	11 x12	120	240 -2 x 120	113	340 -3 x 113	11.5
FS-4	465	30	439	11 x16	97	290 -3 x 97	97.5	390 -4 x 97.5	11.5
FS-6	515	30	489	11 x16	113	340 -3 x 113	110	440 -4 x 110	11.5
FS-8	555	30	540	11 x16	97.5	390 -4 X 97.5	490	98 -5 X 98	11.5
FS-11	665	30	640	11 x16	110	440 -4 x 110	114	570 -5 X 114	11.5
FS-16	785	40	750	11 x24	104	520 -104 X 5	113	680 -6 X 113	11.5
FS-20	1085	40	1050	11 -x24					

2.5.2. Cyclone characteristics

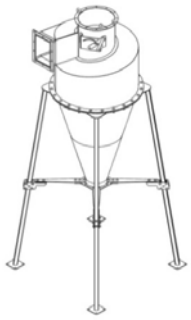
FS Cyclone

Type	Total volume	Total mass	Upper body mass	Lower body mass
	m^3	kg	kg	kg
FS-3	0.48	68	41	27
FS-4	0.69	83	49	34
FS-6	1.38	122	71	51
FS-8	1.9	147	86	61
FS-11	3.6	206	121	84
FS-16	4.7	252	158	94
FS-20	6.1	409	265	143



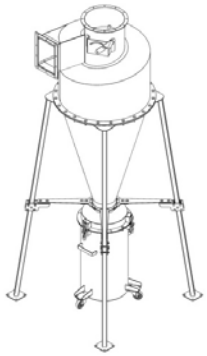
FS Cyclone with legs

Type	Total volume	Total mass	Leg mass
	m³	kg	kg
FS-3	0.48	113	45
FS-4	0.69	131	48
FS-6	1.38	174	52
FS-8	1.9	203	56
FS-11	3.6	266	60
FS-16	4.7	385	133
FS-20	6.1	537	128



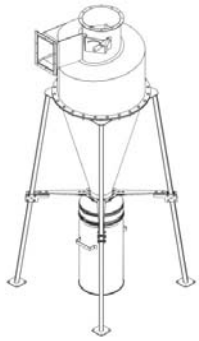
FS Cyclone with legs and heavy dust bucket

Type	Total mass	Dustbin mass	Dustbin volume
	kg	kg	m³
FS-3	146	33	0.1
FS-4	164	33	0.1
FS-6	207	33	0.1
FS-8	236	33	0.1
FS-11	299	33	0.1
FS-16	418	33	0.1
FS-20	570	33	0.1



FS Cyclone with legs and light dust bucket

Type	Total mass	Dustbin mass	Dustbin volume
	kg	kg	m³
FS-3	126	13	0.1
FS-4	144	13	0.1
FS-6	187	13	0.1
FS-8	216	13	0.1
FS-11	279	13	0.1
FS-16	398	13	0.1
FS-20	550	13	0.1



2.6 Pressure loss

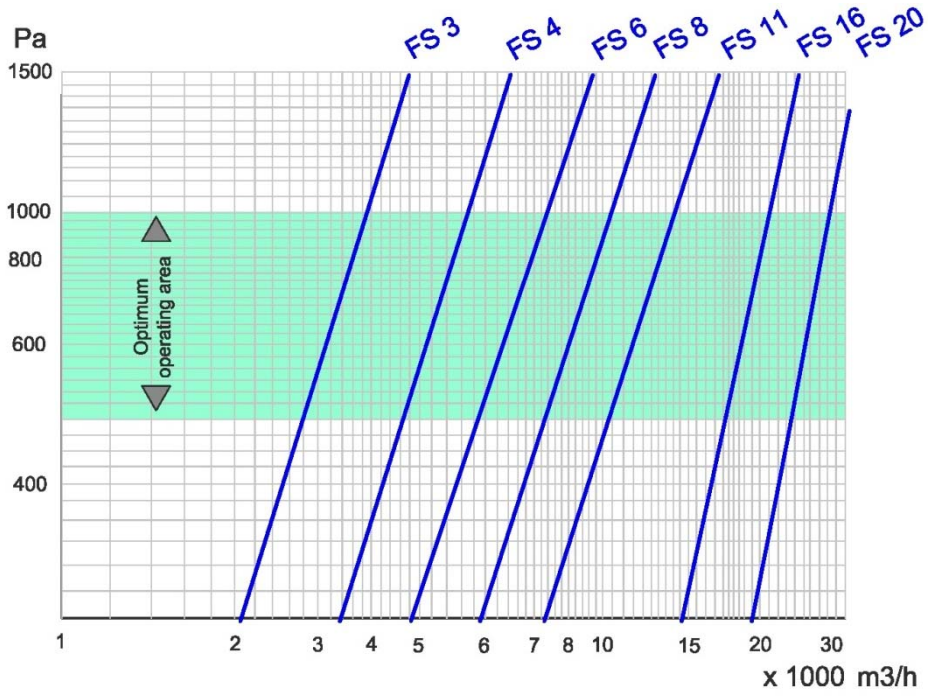


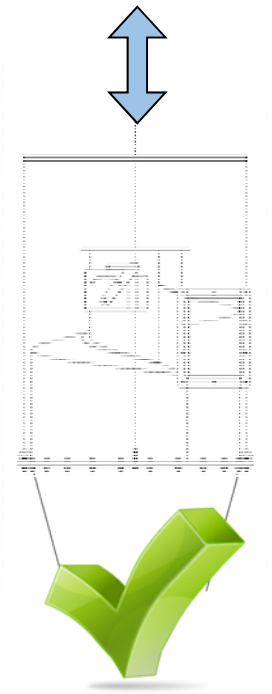
Diagram stating the pressure loss in FS cyclones at a given air volume.

3. Mounting instructions

The installation of the cyclone has to be performed by qualified personnel only. For heavy parts use the right equipment and do not work alone.

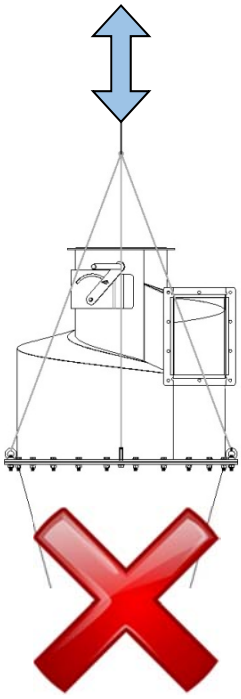
3.1. Lifting the cyclone

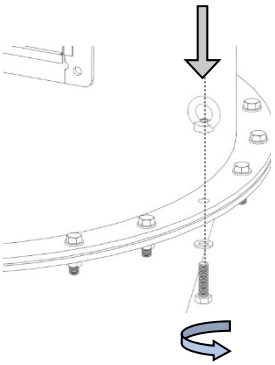
Always move and lift the cyclone to the desiderate place with the help of the lifting eyes. Or fix lifting eyes on the center flange of the cyclone.



Lifting method for

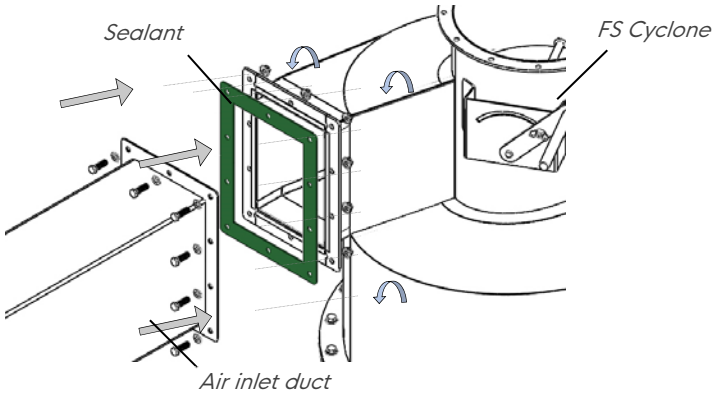
FS cyclones



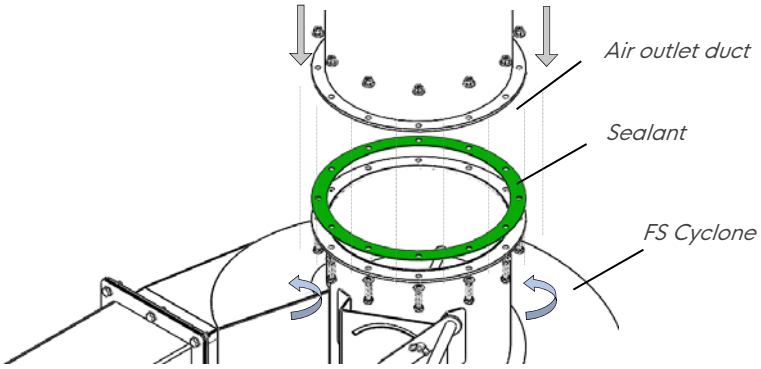


3.2. Cyclone connections to the ducting

Step 1 : Use sealant (or sealing tape) on the cyclones rectangular inlet duct and connect it to the duct with the correct fasteners.



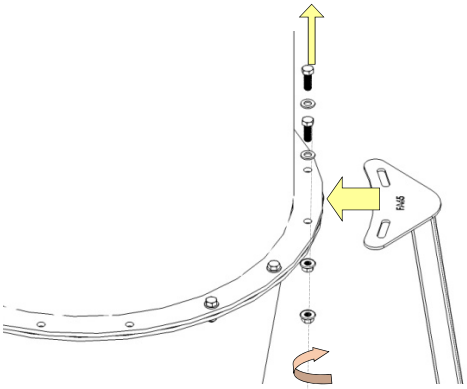
Step 2: Use sealing tape on the cyclones higher flange and connect it to the duct with the correct fasteners.



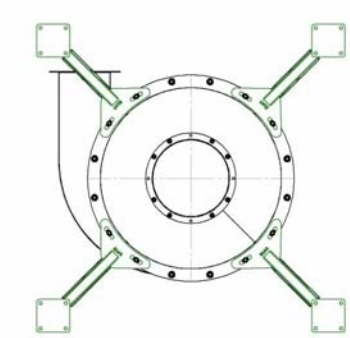
3.3. Cyclone leg assembly

Step 1: Please follow the installation steps in Chapter 3.1. for cyclone installation.

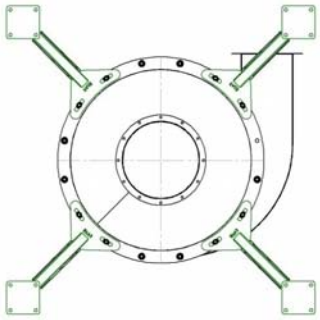
Step 2: Unscrew the bolts where legs are being positioned and position the leg to the bottom part of the cyclone's hopper flange.



CAUTION ! Make sure each leg is in the right position.

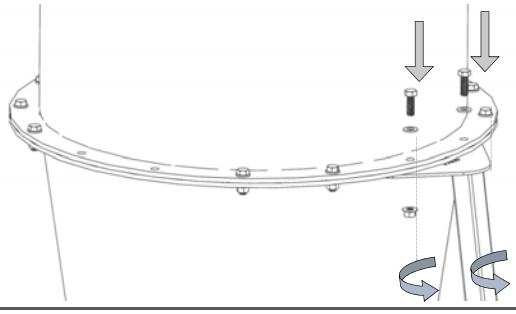


LEG SUPPORT POSITIONING FOR FS CYCLONES LEFT SIDE



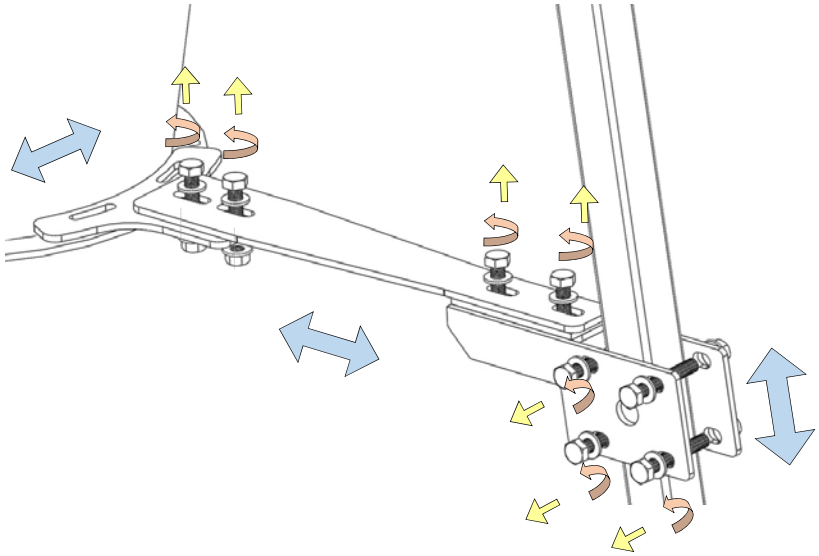
LEG SUPPORT POSITIONING FOR FS CYCLONES RIGHT SIDE

Step 3: Bolt the top of each leg to the middle flange of the cyclone with the correct fasteners.

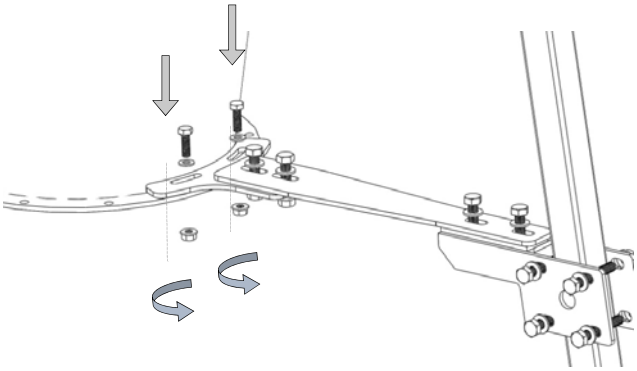


Step 4: Repeat Step 2 and Step 3 to attach the other three leg supports.

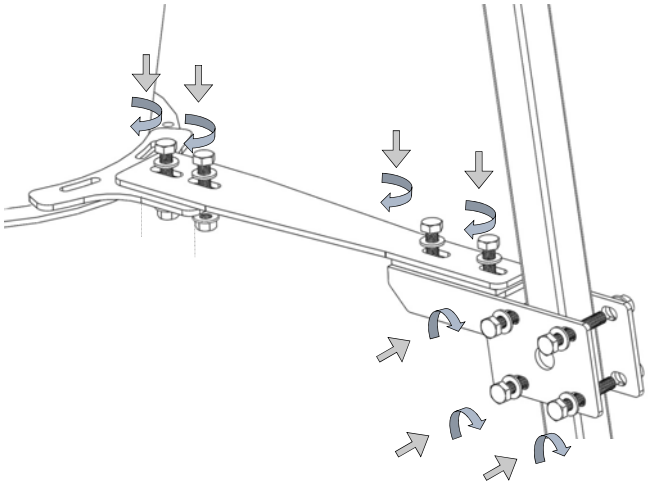
Step 5: Loosen all the fasteners from the lower arm of the leg support.



Step 6: Attach the lower arm to the cyclone's hopper lower flange with M10 fasteners.



Step 7: Tighten all the loose fasteners for a good fixation.



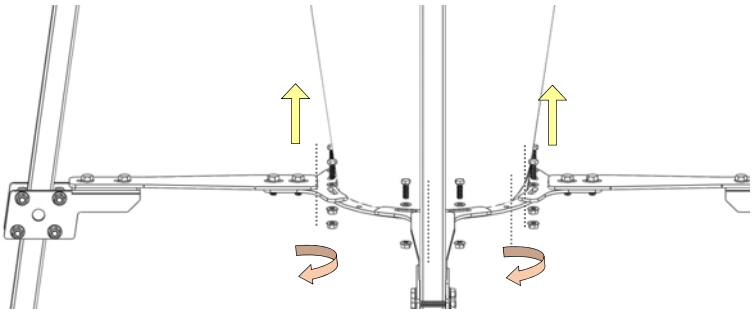
Step 8: Repeat the Step 5, Step 6 and Step 7 for the other leg supports.

Step 9: Anchor the legs to the floor with the correct fasteners.

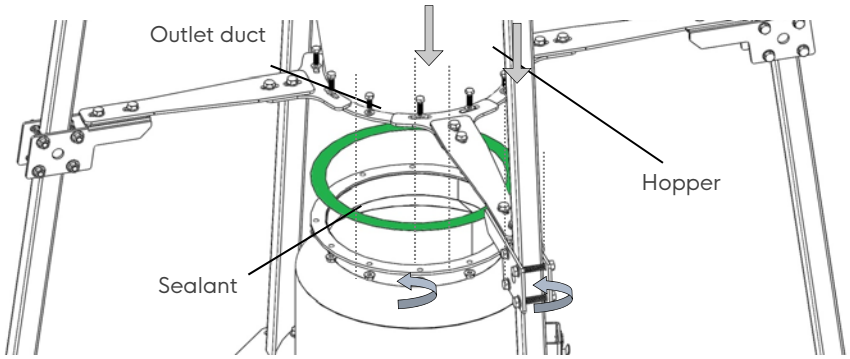
3.4. Cyclone dust bin assembly

Step 1: Please follow the installation steps in Chapter 3.2. for cyclone and legs installation.

Step 2: Remove all fasteners from the lower flange of the cyclone.



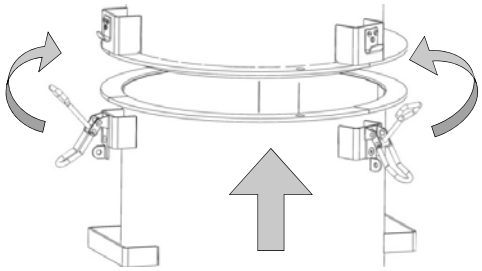
Step 3: Use sealing tape on the connector's flange and connect it to the lower flange of the cyclone with the correct fasteners.



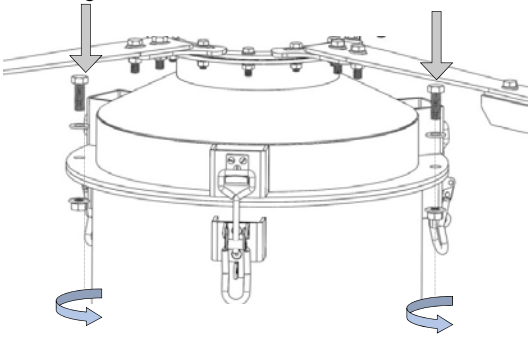
Step 4: Attach the dustbin :

3.4.1. For heavy dustbin

Step 1 : Lock the dustbin to the transition with the three clamps.

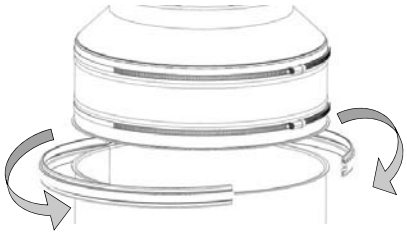


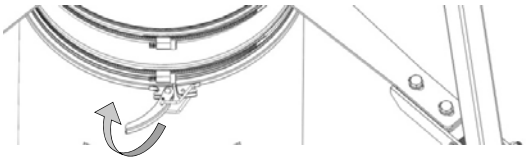
Step 2 : Screw the bolts to the flange of the dustbin.



3.4.2. For dustbins with flexible connection

Step 1 : Lock the dustbin to the connector with the lock ring.



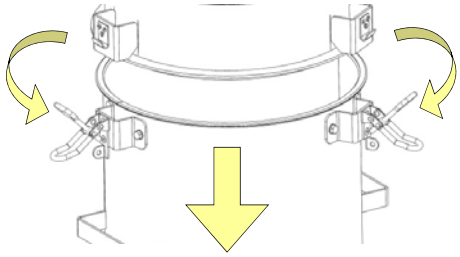


3.5. Removing the dustbin

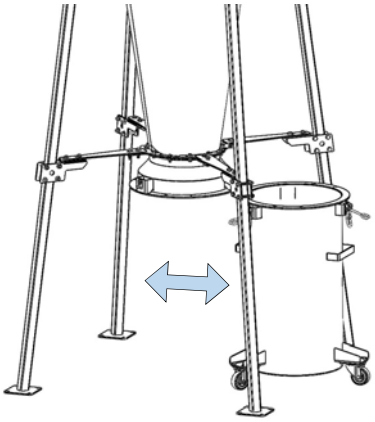
Step 1: Unlock the dustbin.

3.5.1. For dustbins with rigid connection

Step 1 : Unlock the three clamps from the dustbin.



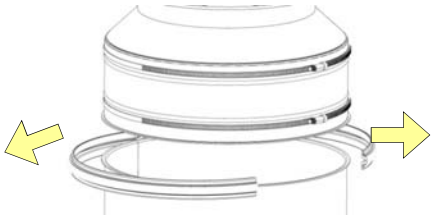
Step 2: Roll the dustbin to the desired location and empty its contents.



Step 3: Fix the dustbin again. Please follow the Step 4 in Chapter 3.3.

3.5.2. For dustbins with flexible connection

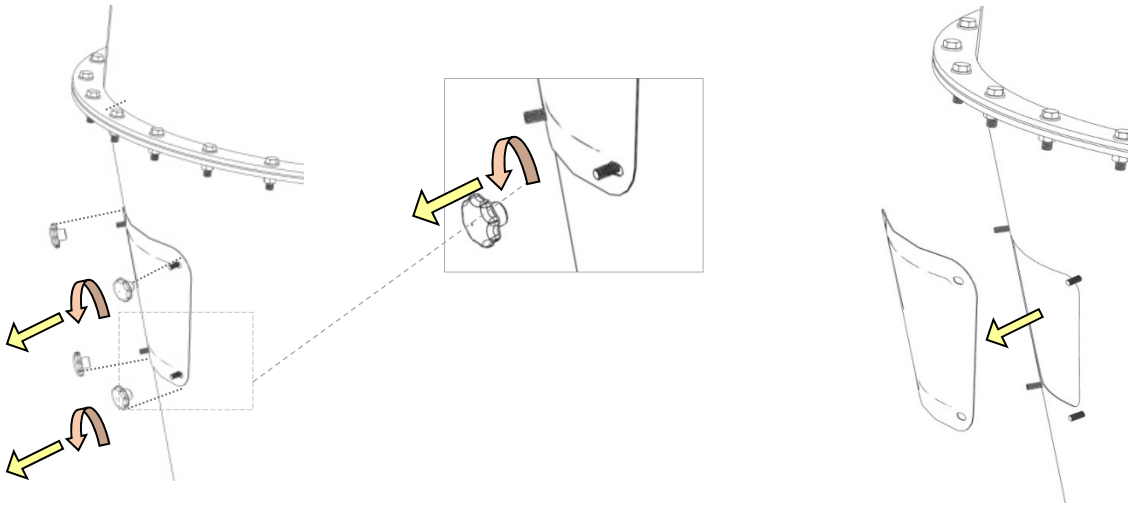
Step 1 : Unlock the lock ring which fixes the dustbin to the connector.



4. Maintenance and spare parts

The installation, connection, start-up and maintenance of the cyclone has to be performed by qualified personnel only.

Clean the cyclone regularly. An inspection door is installed to check the inside of the cyclone. To open the door, unscrew the star knobs and remove the door.



If the dust outlet is blocked, please clean the inside of the cyclone.

Replace any components that are damaged or broken.

CAUTION ! Place the door back on the cyclone hopper and fix it with the correct star knobs before starting up the installation.

4.1. Replacing a cyclone body part

Reverse the procedure described in point 3.2.

4.2. Replacing the leg support

Reverse the procedure described in point 3.3.

4.3. Removing the dustbin transition

Reverse the procedure described in point 3.4.

5. Occupational Health and Safety

Prior to start and use, it is important to get acquainted with the present Use and Maintenance Manual.

WARNING : Unsure mounting could result in an uncontrolled detachment of the device and would cause serious hazard to personnel / people in the vicinity.

6. Transportation, storage & handling

6.1. Transportation

The cyclones are shipped secured, palletized, and properly packed to prevent shifting and damages during manipulation. The cyclones should always be transported covered and protected from atmospheric elements.

CAUTION **:** Do not stack during transport !

6.2. Storage

Store the cyclones palletized, and covered and protected from atmospheric elements.

6.3. Handling

Always lift with an even weight distribution. Never lift the cyclones by mobile or sensitive parts.

Make sure that the mounting surface is even, stable and that it can bear the load of the cyclones to ensure the proper functioning of the cyclones.

7. Terms of warranty

The period of warranty for the purchased device is indicated in the general sales conditions.

The warranty does not comprise:

- Producer accepts no liability for any consequences following from the operational use that is in contradiction to the purpose of application,
- Defects and damages arising during the incorrect use and in application that is inconsistent with the present manual,
- Mechanical and electrical damages being caused during improper storage and transport or incorrect maintenance,
- Structural modifications, or changes / adaptations introduced by the user on one's own, are not permitted,
- Inefficiency following from the normal operational exhaustion.

Infringement of the section "Restrictions" of the Use and Maintenance Manual and especially modifications undertaken by User on one's own shall result in the loss of warranty validity.

8. Troubleshooting Guide

Problem	Possible cause	Possible solution
– Premature wear on tangential inlet	– Very abrasive material	– Review the cyclone material (Hardox, AISI,..)
		– Use a replaceable outer wear plate on inlet
	– Air forced against outer wall	– Use an off-center inlet transition or reduce m/s
– Premature deterioration of cyclone body	– Very aggressive material	– Review the cyclone material (Hardox, AISI,..)
	– Very aggressive exterior elements (ex. Sea coast)	– Review the cyclone material (Hardox, AISI,..)
	– Unbalance/uneven/loose assembly	– Review assembly, base
– Insufficient separation	– Wrong model for application	– Select another model
	– Undersized cyclone for air volume	– Choose a bigger model
	– Air speed to fast	– Reduce air speed going in
	– Particles too light	– Wrong model for application
	– Too much turbulence at bottom of hopper	– Place an expansion chamber
– Material not "dropping" down	– Air speed to fast	– Reduce air speed going in
	– Particles too light	– Wrong cyclone for application
	– Too much turbulence at bottom of hopper	– Place an expansion chamber
	– Material is wet/sticky	– Improper use of cyclone
	– Material is electrostatically charged	– Improper use of cyclone
	– Leakage at dust outlet	– Insure airtightness of outlet
– Material is not evacuating	– Too much turbulence at bottom of hopper	– Place an expansion chamber
	– Material is wet or sticky	– Improper use of cyclone
	– "Doming" effect due to material nature	– Check material nature
	– Air coming in from underside	– Review airtightness of assembly &/or discharge equipment
	– Undersized rotary valve	– Choose bigger rotary valve
– Material sticking to the sides	– Material too wet/sticky	– Wrong application
	– Condensation along inner walls	– Avoid condensation / hot-cold reactions
– Paint is chipping/peeling	– High temperature material going through	– Reduce material temperature
	– External environment factors	– Change to AISI unpainted body
– Air not flowing through	– Clogging in inlet ducting	– Remove clog

If the above does not help, please contact your supplier.

9. Dismantling and recycling

When dismantling a unit, be sure to keep in mind the following important information:

- As the unit is dismantled, set aside all still functioning parts to re-use them on another unit.
- You should always separate the different materials depending on their type: iron, rubber, oils, greases, etc...
- Recyclable parts must be disposed of in the appropriate containers or brought to a local recycling company.

The rubbish must be collected in special containers with appropriate labels and disposed of in compliance with the national laws and/or local legislations in force.

CAUTION !

It is strictly forbidden to dispose of toxic wastes in municipal sewerage and drain systems. This concerns all oils, greases, and other toxic materials in liquid or solid form.

14. Maintenance log

date	description

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