

Connecting the Clean Air Enterprise electric Air Filter to the building control system Operating instructions

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2.1 Mains connection L, N, PE

The power supply for smaller systems up to 1kW connected load of the filter system is 1 -phase with 230V alternating current via a separate, on-site fuse FILS13C. The cable required for this is 3x1.5mm². Earth, neutral and phase are connected.

Stecker CN1 auf Steuerung CALS				
Nummer	Name	Farbe	Gruppe	Signal-Beschreibung
1	PE	gelb-grün	Netz-Anschluss	Schutzleiter PE
2	N	blau		Neutralleiter
3	L	braun		Phase 230VAC

Abbildung 2: Anschlussbelegung CN1 Netzanschluss 1 phasig

The power requirement depends on the number of electrostatic precipitators, i.e. the size of the system. As a project planning value, 12W per 1000m³/h can be calculated.

Systems up to approx. 100'000m³/h can be designed single-phase.

2.1.1 Material mains connection

Suggested fault current circuit breaker (on-site, not included in the scope of delivery)



Type: Hager
ADS913C FI/LS switch
1P+N6kA C13A 30mA 2TE

E-No: 804129264

Caution: In the case of a powerful sub-distribution with a high short-circuit current, the back-up fuse must be designed according to the breaking capacity of the RCD/LS. Consult your electrical planner who planned the distribution.

Suggested connection cable (on-site, not included in the scope of delivery)



Type: Apparatus cable
3x1,5mm² LNPE
halogen-free, light grey

E-No: 114015325

Tips: The PLC can switch the supply of the electrostatic precipitator system on and off via a contactor. In addition, the mains supply can be routed via an electrostatic precipitator main switch (provided by the customer).

2.2 Connection of the electrostatic filter system to the building management system

The electrical connection between the building management system and the electrostatic precipitator system is made with safety extra-low voltage SELV, i.e. on the side of the building management system as well as on the side of the electrostatic precipitator system, the units are supplied with non-hazardous safety extra-low voltage.

2.2.1 Input signal 0-10V Preset value of the air volume (GLS EFA)→

The control with the building management system is done via PLC signals. The preset value for the performance of the electrostatic precipitator system is necessary via a 1-10V signal from the PLC to the electrostatic precipitator system. The signal is galvanically separated from the mains voltage both on the PLC side and on the side of the electrostatic precipitator.

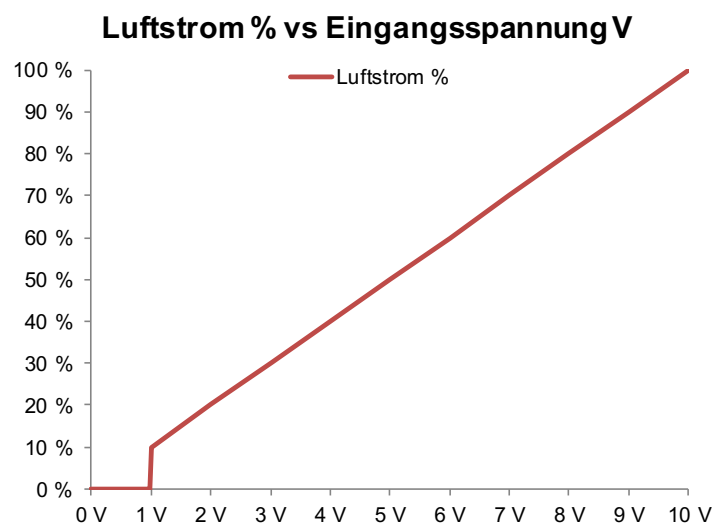


Abbildung 3: Eingangssignal 0-10V

For the electrostatic precipitator to switch on, the input signal must be greater than 1.0V for at least 5 seconds. For the electrostatic precipitator to switch off, the input signal must be below 0.7V for at least 5 seconds.

An input signal of 10V indicates to the electrostatic precipitator the maximum air flow that the unit can handle. Depending on the input voltage applied, the electrostatic precipitator optimises the operating point for maximum cleaning effect and optimum energy consumption.

For this input signal, the analogue output of the GLS PLC must be connected to the signal ASIG and the reference ground AGND.

Stecker CN5 auf Steuerung CALS						
Nummer	Name	Farbe	Gruppe	Signal-Beschreibung	4er & U72-Farbe	
1	L12V	weiss (ws)	RS485	Speisung, 12V, 500mA max. (für FOX)	3	a - weiss
2	LGND	braun (bn)	BUS	Masse, 0V		b - grün
3	RXTX+	grün (gn)		RS485 RxTx+ reserviert für Datenkommunikation		c - türkis
4	RXTX-	gelb (gb)		RS485 RxTx- reserviert für Datenkommunikation		d - violett
5	CL	grau (gu)	Signal	Reinigung Signal zu Arbeitskontakt von E-Filter	2	a - weiss
6	CL	rosa (rs)	Reinigung	Reinigung Signal zu Arbeitskontakt von E-Filter		b - orange
7	EO	blau (bl)	Signal	Fehler Signal an Arbeitskontakt von E-Filter		c - türkis
8	EO	rot (rt)	Fehler	Fehler Signal an Arbeitskontakt von E-Filter		d - violett
9	AGND	schwarz (sz)	Signal	Masse, 0V für Analogeingang	1	a - weiss
10	ASIG	violett (vi)	Fan-Speed	Analogsignal: Ansteuerung 0-10V von Gebäudesteuerung zu E-Filter		b - blau
Schirm				Schirm-Anschluss im Schaltschrank an Erdung		Schirm

Abbildung 4: Anschlussbelegung CN5 SPS-Interface zu Gebäudeleitsystem

Suggested control cable (on-site, not included in the scope of delivery)



Type: Control cable
 10 x 0.5mm² shielded
 halogen-free, grey
 Core colours according to DIN 47100

e.g.: Supplier ISOMET: 4713.710 ISOCOL-ECO C 10 x 0.5 mm² grey DIN 47100 halogen-free

Figure 4 also shows the alternative assignment of a U 72-3 x 4 cable.

The control cable must not exceed the maximum outer diameter of 10 mm, otherwise it will not fit into the intended attachment on the unit.

Note: If the shield cannot be connected in the control cabinet of the PLC, it is possible to connect the shield to the Faston connection "shield". However, the one-sided connection in the control cabinet is preferable.

Attention: The shield may only be connected on one side of the cable!

2.2.2 Floating contacts (EFA GLS)→

The control unit of the electrostatic precipitator system has two potential-free relay outputs that indicate the status of the electrostatic precipitator system to the building management system. One signal indicates whether the electrostatic precipitator system is working properly. This is the signal EO.

The table below indicates which signal combinations are possible:

Fall	Cleaning CL	Error/OK EO	Bedeutung
1	inaktiv	inaktiv	Anlage ausser Betrieb oder kein Strom oder hat Störung, Fehler, Defekt
2	aktiv	aktiv	Anlage benötigt Reinigung, läuft aber einwandfrei
3	inaktiv	aktiv	Anlage in Betrieb und arbeitet einwandfrei
4	aktiv	inaktiv	Anlage aktiv, Tür-/Schlüsselschalter offen oder Anlage wartet auf 1. Start

Abbildung 5: Bedeutung der Rückmeldesignale

Signal CL	is active:	Relay 1 pulls in	LD1 lights up
Signal CL	is inactive:	Relay 1 drops out	LD1 dark
Signal EO	is active = OK:	Relay 2 pulls in	LD2 lit, LD3 dark
Signal EO	is inactive = Error:	Relay 2 drops out	LD3 lights up, LD2 dark

The PLC of the building management system can detect whether the electrostatic precipitator system has power. When the system is started, case 4 is output for at least 5 seconds. If a preset value greater than 1V is then applied to the analogue input, the CL signal becomes inactive (case 3). If the door is open or the key switch for the high voltage is open, case 4 remains active despite the analogue voltage being applied.

If the unit needs cleaning (case 2), case 2 is displayed after 5 seconds.

The PLC can use this logic to control all lines to and from the electrostatic precipitator at start-up, especially if the PLC can also switch the voltage supply to the electrostatic precipitator.

Attention: A maximum of 24V/1A safety extra-low voltage may flow through the contacts and under no circumstances mains voltage!

3 Installations on the monobloc

The electrostatic precipitators and the blue electrostatic precipitator nodes are installed inside the monoblock. The control electronics (master) with the power supply unit is installed outside the monoblock. A control line leads into the monoblock. This line leads to the first electrostatic precipitator and then on from electrostatic precipitator to electrostatic precipitator.

The connecting cables between the master and the first electrostatic precipitator and between the electrostatic precipitators are supplied.

3.1 Plant overview

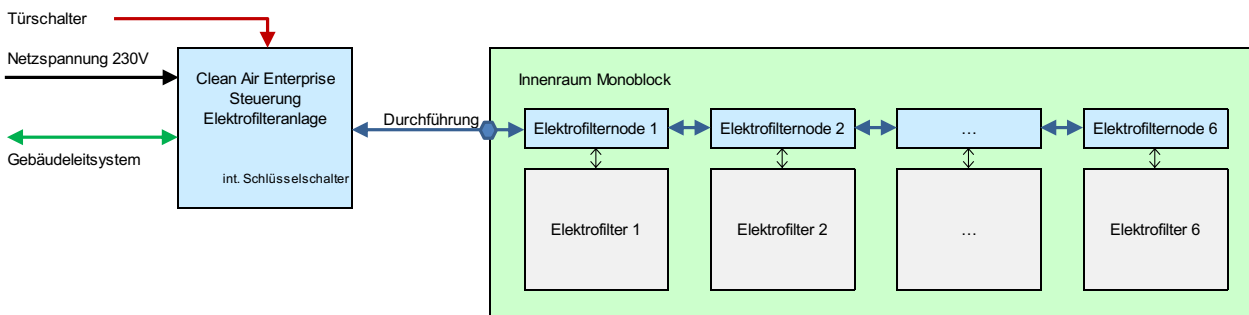
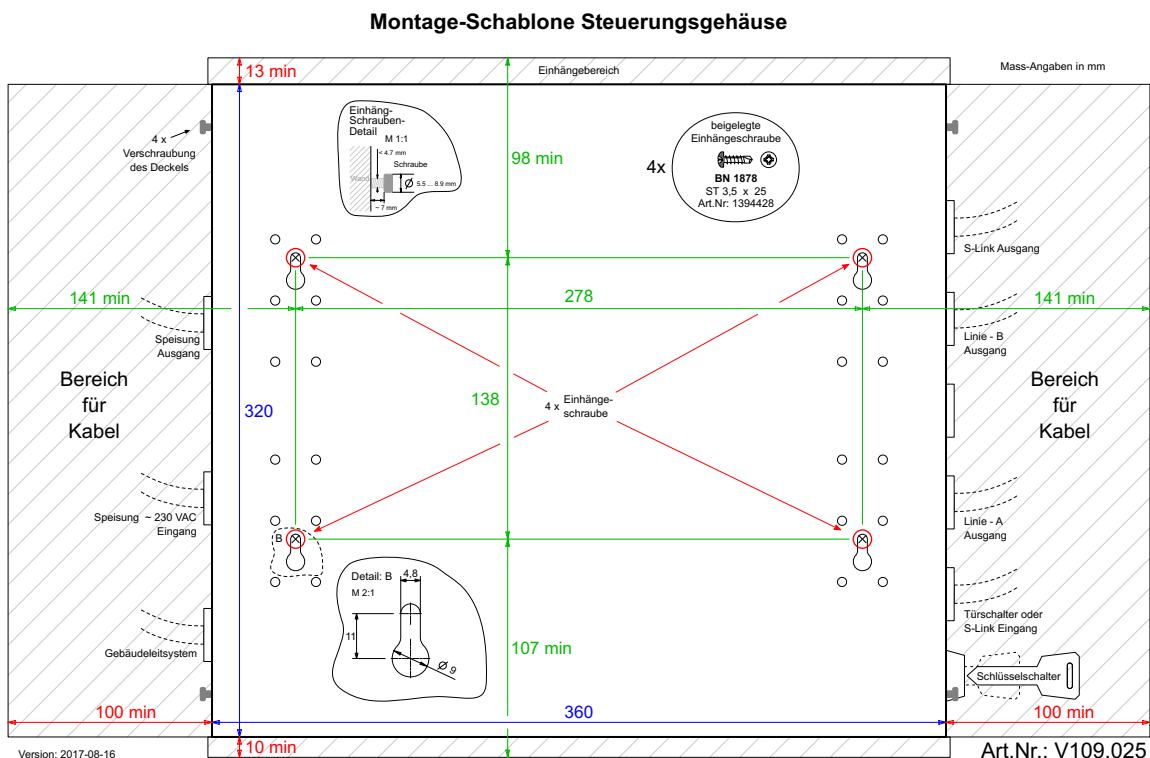


Abbildung 6: Übersicht Elektrofilteranlage am bauseitigen Monoblock

Connect the mains voltage and the building management system as in 2.1, 2.2 above. The safety door switch (see 3.3) for switching off the voltage supply to the electrostatic precipitator high-voltage generation must be installed in such a way that it is impossible to hold the door open without being able to operate the switch. Several door switches can also be connected in series. The key switch is used to alternatively switch off the high voltage.

3.2 Housing assembly of the control unit

The fixing template of the control box with the drilling points for the suspension screws.



Enclosed are the self-tapping sheet metal screws as suspension screws. Alternatively, the box can also be mounted on two vertical support rails. The support rails are available as accessories on request.

3.3 Door switch and key switch connection

The door switch and the key switch are operated with safety extra-low voltage and are interrogated by the control unit. The key switch is already connected to plug CN4 and is already supplied with the master.

Stecker CN4 auf Steuerung CALS				
Nummer	Name	Farbe	Gruppe	Signal-Beschreibung
1	Key	weiss	Security	Schlüsselschalter Kabel
2	Key	weiss		Schlüsselschalter Kabel

Abbildung 7: Anschlussbelegung CN4 Security Key



A safety door switch must be used for this system. A recommended door switch is one from OMRON's D4NS series. For example, D4NS-4AF or D4NS-4BF could be used together with a key from OMRON's D4DS series. A pair of NC contacts from the D4NS is connected to the CN11 connector on the control unit. For the cable connection, a suitable cable gland with a maximum thread length of 9mm is required on the door switch side. For the D4NS-4AF or D4NS-4BF door switch, it is an M20 cable gland.

The door switch is connected to plug CN11 during installation. It ensures that no dangerous high voltage can be applied to the filters when the door is open.

Stecker CN11 auf Steuerung CALS				
Nummer	Name	Farbe	Gruppe	Signal-Beschreibung
1	Door	weiss	Security	Türschalter Kabel
2	Door	braun		Türschalter Kabel

Abbildung 8: Anschlussbelegung CN11 Security Door

Attention: It is essential that the safety circuits Door and Key are closed so that the electrostatic precipitator system runs!

If the safety circuits are not closed, the REL3 relay drops out. For the 24V power supply to be active, the software must switch on relay REL3 and the safety circuits must be closed. The LED LD4 lights up when the REL3 relay is active.

The safety circuits are linked in hardware with the logic signal of the microcontroller.

3.4 Cable feed-through through monoblock

The control cable that connects the control electronics with the first electrostatic precipitator node inside the monoblock must be led through the monoblock housing. A special cable bushing is used for this purpose, through which a cable ready made up with plugs can be passed.



For this cable gland, it is necessary to make a 32 hole through the monobloc housing and then insert the cable through the slotted seal and the cable gland. The cable gland snaps into place and is secured from the inside with the union nut. The cable gland is absolutely airtight.

The cable gland is included in the scope of delivery of the unit.

If necessary, a slightly larger hole must be drilled on the inside of thick housings so that the union nut can be fitted.

The cable is connected to the connector "CN6 to Nodes".

4 Technical specification electrostatic precipitator electronics

Mains connection

Power supply: 230VAC 50/60Hz single phase
Power consumption: 5W plus 40W per filter
Hedging: FI/LS 13C

Signal input for air volume (fan speed)

Signal voltage: 1-10V Input impedance approx. 100kOhm

Potential free contacts

Potential-free signal contacts: Relay REL1 and REL2: 24V/1A max. SELV

General specifications

Maximum number of filter nodes	6 per line server	(Attachment with	21'000m ³ /h)
Maximum number of LineServers:	6 per master, total 36 nodes	(Attachment with	126'000m ³ /h)

5 Change log document

Date:	Visa:	Description:
13 March 2017	RFO	Initial version
26 June 2017	MAB	Corrections, adapted graphics, cable U72
16 August 2017	MAB	Template for housing assembly
3 May 2018	MAB	Control cable outer diameter