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Urea Dosing System Air Assisted

Installation and Operating Instructions

UDA 7.5

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1. UDA application & presentation

1.1 General scope

The Emitec UDA is designed to deliver an urea flow defined by dosing strategy which is either located in the engine ECM or in the doser itself (see chapter 1.4 configuration).

The UDA is using the air supplied by the system to bring the dosed volume of urea to the injection nozzle.

The UDA is having a build in heating device that allow the system to operate with outside temperature down to -40°C when the system is supplied with urea at more than +5°C.

The UDA is integrating its self-diagnostic procedure, the UDA is informing the system about its status by sending OBD/diagnostics telegrams over the CAN bus.

1.2 Doser overview

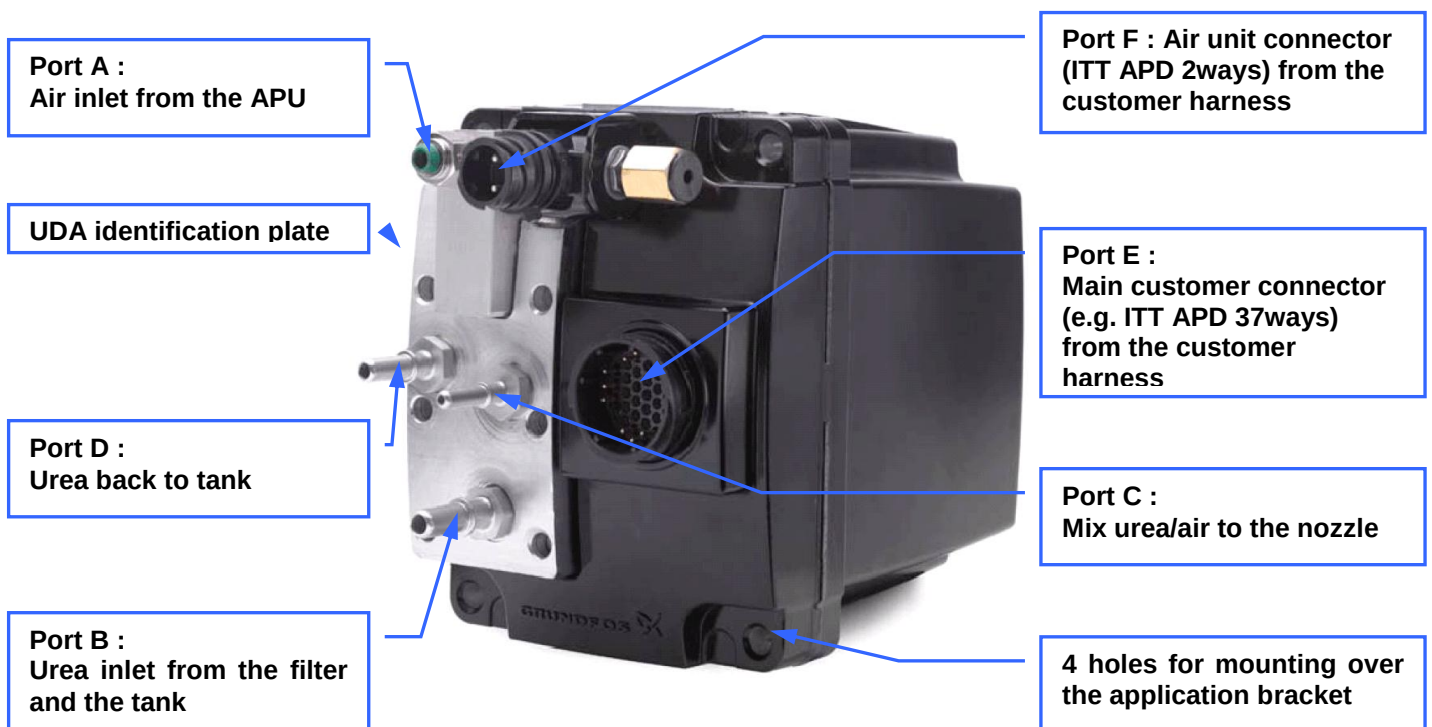
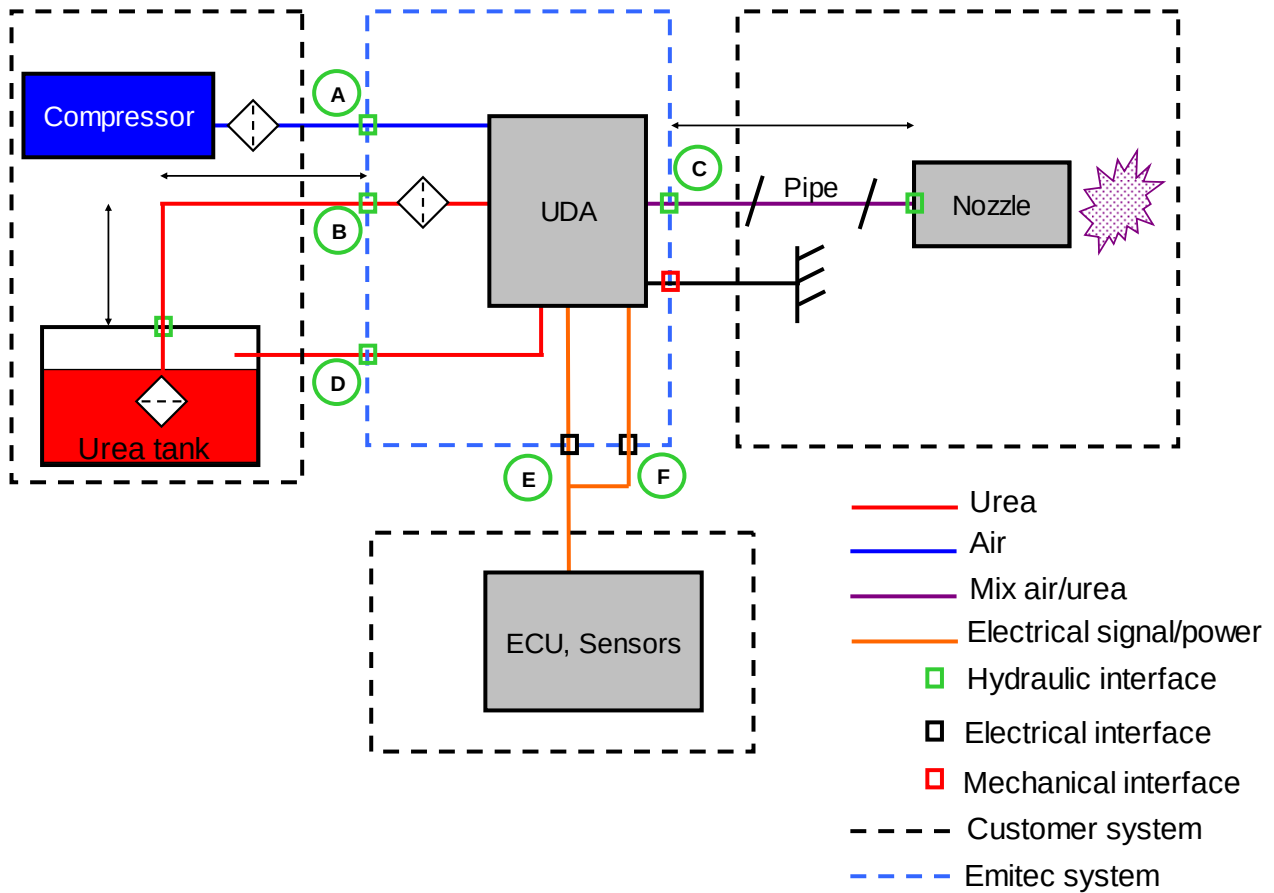


Photo non binding, customized customer version represented in the SCD

The UDA is delivered to the user fitted with dust cap on the 4 hydraulic ports and both electrical port.

1.3 System architecture



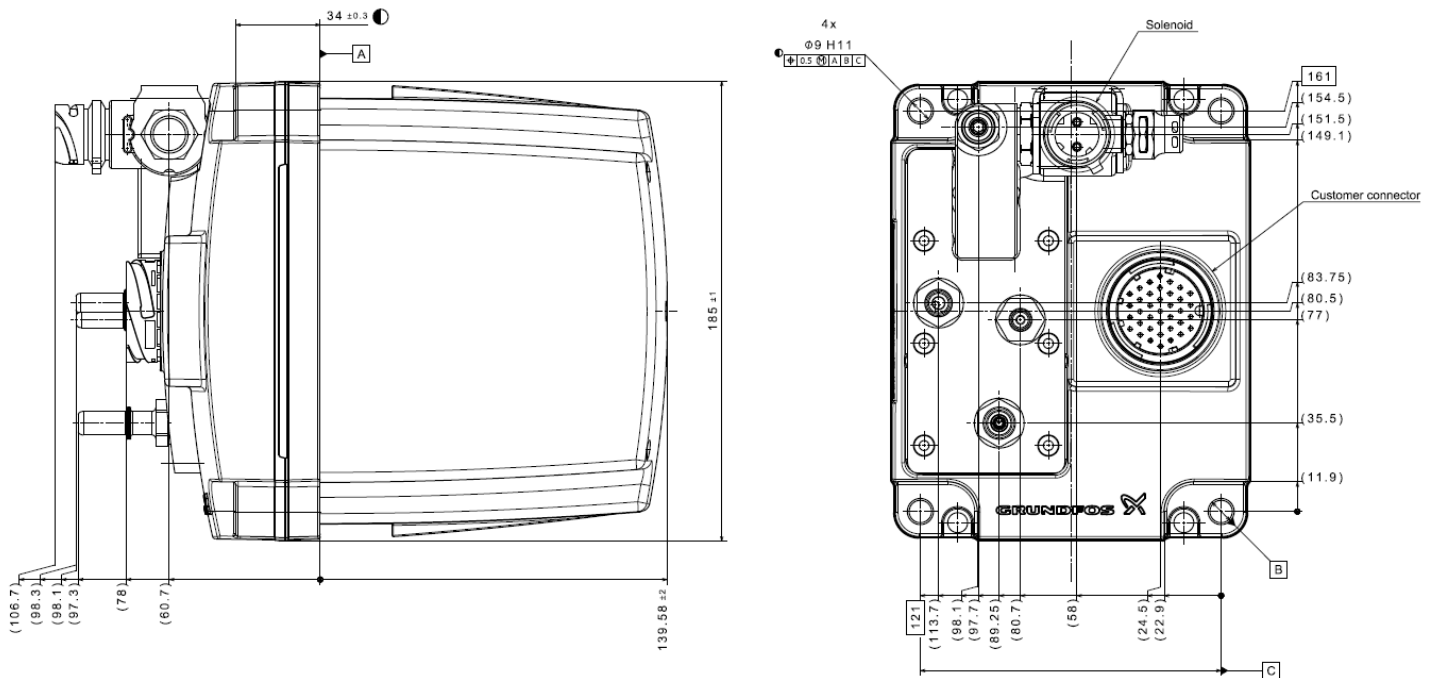
1.4 Configuration

The UDA is available into 3 variants (see appendix 1 for architecture pictures):

Variant	Communication	Voltage	Naming
OEM	CAN BUS	12 24	UDA-OX-12 UDA-OX-24
ECU	CAN BUS / analogue IO	12 24	UDA-EX-12 UDA-EX-24
Sensor based	CAN BUS / analogue IO	12 / 24	UDA-S

X being the hardware code

2. Integration dimensions and physical parameters



2D overall dimension drawings and 3D volume files in IGS, Step and Catia format are available on request.
The dry pump weight is 4.6 Kg excluding shipping hardware.

The Dosing unit is designed to be mounted on the vehicle chassis, the dosing unit is not designed to stand into the engine bay.

3. Operating conditions

The Dosing unit is specified to dose from -40C to +85C as ambient temperature

Important note: Whatever the ambient temperature is :



THE SOLENOID VALVE COIL MAY BE VERY HOT AND THE CONTACT WITH HUMAN SKIN DURING AND AFTER OPERATION MUST BE AVOIDED

3.1 Standard priming sequence

At engine key ON the UDA is receiving the starting procedure. The UDA accuracy is sensitive to the presence of air in the suction line. The keying on operation allows the ECM to deliver to the UDA a message starting the priming sequence. The priming sequence is running for 30", it can be repeated up to 20 times until the priming operation is properly completed. If the UDA is not properly primed after the sequence then a telegram no air or no urea is sent to the ECM.

Specific setup can be implemented but customer will be responsible for the doser behaviour.

3.2 Running phase

The dosing unit delivers the required amount of urea. The air is always flowing to the nozzle

3.3 Standard purging phase

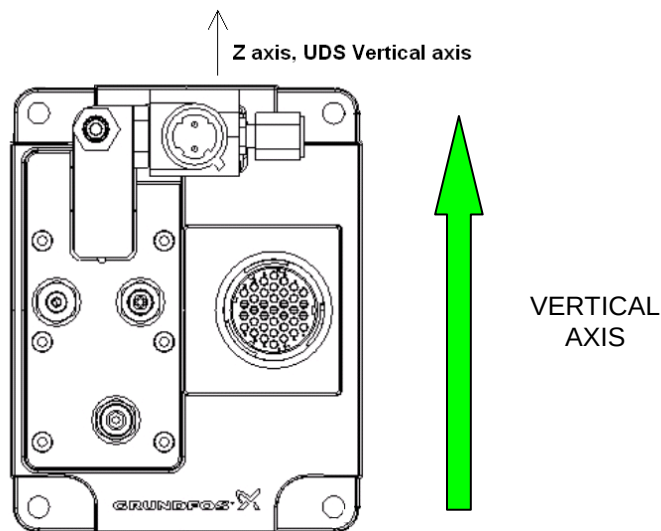
When the engine is key OFF, the air is flowing to the nozzle to purge the nozzle line. The purging sequence duration is 30 seconds. If the supply voltage is switched off before the end of the purging phase then the dosing unit records an incomplete purge sequence.

Specific setup can be implemented but customer will be responsible for the doser behaviour.

4. Interfaces

4.1 Mechanical interface

The UDA is designed to be flanged over a vertical bracket. (Dosing unit location in application see § 2)
For proper priming operation it is important that the UDA vertical axis Z is pointing top vertical. 
In case of any doubt or other installation orientation, please take contact with Emitec



FOR PROPER OPERATION, IT IS THE MOST IMPORTANT THAT THE UDA IS MOUNTED IN RESPECT TO ITS VERTICAL AXIS (THE SOLENOID VALVE MUST BE ON THE TOP)



THE UDA MUST BE DISCONNECTED BEFORE ANY WELDING ON THE VEHICLE

Note that the system once primed can run when the vehicle itself is having angularity +/- 45 degrees worst case.

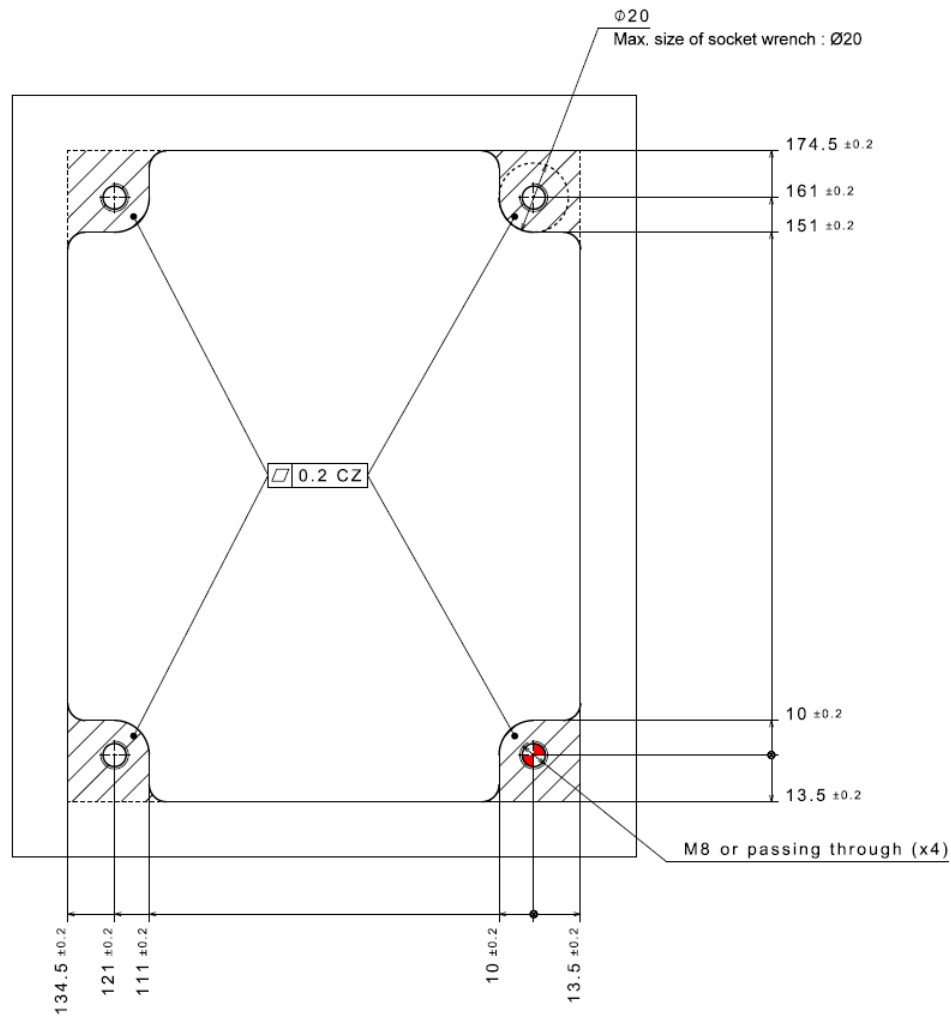
The UDA is a high precision item and it is from the most importance that the receiving bracket is flat within 0.2mm in order to avoid UDA case deformation.

We specify to bold the UDA over a flat bracket by the mean of 4 M8 screws torqued at 2.2 daN.m.
Flanged screws or nuts or screws with thick washer are needed to bolt the UDA over its mounting bracket.



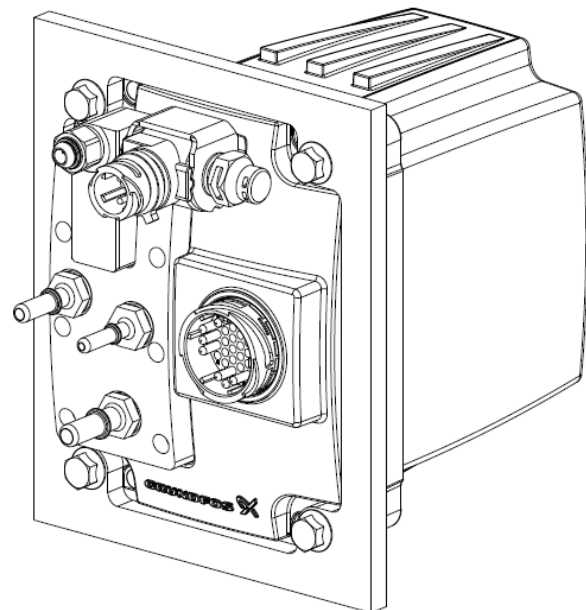
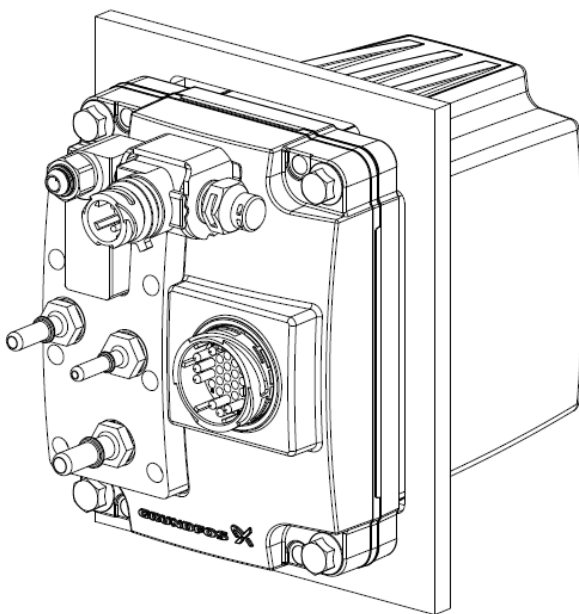
IT IS STRONGLY RECOMMENDED THAT THE UDA HAS TO BE GROUNDED TO CHASSIS FOR PROPER EMC PROTECTION. TO DO SO THE ELECTRICAL CONNECTION MUST BE DONE WITH PROPER SCREWS OR WASHER THAT INSURE A PROPER GROUNDING.

The UDA can be either front mounted or rear mounted; the bracket flange should follow the shape below:



REAR MOUNTING

FRONT MOUNTING



4.2 Hydraulic interface

The UDA ports are noted as follow:

Port name	Application	Interface	Pump thread interface
Port A	Air supply inlet	Connected to the APU	M12x1.5 as per ISO 965 Thread length 8 mm
Port B	Urea supply inlet	Connected to the Urea filter outlet	M12x1.5 as per ISO 4039-1 *
Port C	Air & Urea mixed outlet	Connected to the exhaust pipe nozzle	M12x1.5 as per ISO 4039-1 *
Port D	Urea return to tank	Connected to the urea tank, (no foot valve)	M12x1.5 as per ISO 4039-1 *

Note *: Those port connection M12x1.5 as per ISO 4039-1 are reduced to 9 mm deepness, contact Emitec for more information.

Emitec specify using the quick fitting and supplier specified mounting torque, over torque has to be avoided. We specify Poka Yoke on connection to avoid any mix of pipe during servicing operation.

Emitec recommends quick fitting type SAE as per J2044. Other connection types have to be discussed and agreed during development phase. Connectors type agreed with customer are specified into the SCD.

For proper UDA operation and best performances we specify to pipe the UDA according to the following table.

INTRODUCTION OF ANY UREA (EVEN IN A VERY SMALL AMOUNT) IN FORM OF LIQUID OR CRYSTALS INTO THE AIR SUPPLY PORT A IS CREATING PERMANENT DAMAGE TO THE UDA.



ALL AIR PIPING WHICH HAVE BEEN POLLUTED WITH UREA HAVE TO BE REPLACED BY NEW COMPONENTS.

QUICK FITTING NIPPLE MUST NOT BE EXCHANGED FROM ONE PORT TO ANOTHER

DURING HANDLING AND STORAGE, ALL PORTS HAVE TO BE PROTECTED (E.G. USING DUST CAPS)

Port	Application	Pipe type	Material	Requirement for optimal doser performance
Port A	Air supply inlet	Ø 4 mm ID pipe (equipped with filter and dryer) Design to withstand the maximum air system pressure	PA	Air as per ISO 8573-1 (class 2 for air dew point, class 3 for other air properties)
Port B	Urea supply inlet	Ø 6mm ID pipe (equipped with foot valve and filter)	PA	Max length line: 5m Urea cleanliness see chapter 5.1
Port C	Air & Urea mixed outlet	Ø 3 mm ID pipe Design to withstand the maximum air system pressure	PA + PTFE	Max length line : 3m Line routing shall be downwards
Port D	Urea return to tank	Ø 4 mm ID (no foot valve)	PA	Max length line: 5m Return line on tank side shall not be immersed in the media

On request, Emitec can supply some proposals regarding quick fitting connectors creating Poka yoke on piped connection to the UDA.

Applications deviating from these requirements need to be validated by Emitec. All listed performances were done with above indicated lines. Any changes will need to be tested in order to define potential influence. Emitec won't take any responsibility in case of changes without feedback from customer.

4.3 Electrical interface

Mating interfaces

Customer connector type, pin layout and poke yoke are defined in the Source Control Drawing (SCD)

Air unit solenoid valve connection

APD/DIN 72585 code 3 (green, RAL 6029) 1-2, 2 pins

The UDA Air Unit solenoid coil is supplied with the solenoid valve connector. The supply signal is coming from the UDA main connector through the application harness.

The application harness has to connect the main connector pins # 35 & 36 to the 2 pins solenoid valve connector.



**DO NOT SUPPLY 24 VDC TO THE AIR UNIT VIA THE APD/DIN 72585 CODE 3 1-2, 2 PINS.
THE DOSING UNIT IS SUPPLYING A PWM SIGNAL TO THE AIR UNIT SOLENOID VALVE COIL VIA
APPLICATION HARNESS.
HIGHER VOLTAGE IS DAMAGING THE SOLENOID VALVE COIL**



CAUTION : DO NOT HANDLE THE UDA BY AIR UNIT

4.4 Communication interface

Can Communication

The UDA communication protocol is fully compatible with full SAE J1939 CAN standard.

5. Fluids

5.1 Urea

The UDA is designed to operate only with Urea diluted with water in the ratio of 32.5% in weight as defined in the ISO 22241-1 Standard.

The system has to supply the UDA with liquid urea at 5°C minimum and +55 °C maximum (Urea temperature can reach +85°C but only in peaks (duration ~ 30 min maximum, 24 hours minimum between each peak, total duration: 500h).

Heated lines are recommended to maintain the media temperature. The integrator has to validate the heating efficiency to allow the doser to release the pressure when turning off the system. If this is not possible the integrator shall implement an safety procedure by shutting off the doser before the lines got frozen to allow the pressure release.

Take contact with Emitec if other fluids would be used.



**THE UREA SUPPLY FROM THE TANK MUST BE FILTERED, NO PARTICLES HIGHER THAN 100µm
ARE ALLOWED TO ENTER THE DOSER.**

**BEFORE TO OPERATE THE DOSER, UREA AT THE PORTS HAS TO BE WITHIN THE SPECIFIED
TEMPERATURE RANGE, FREE OF CRISTALS AND ICE.**

Over customer filter lifetime, pressure loss shall not exceed more than 80mbar.

The cleanliness test methods should be according to ISO 16232

Doser contamination resistance:

	25-50 μm	50-100 μm	100-150 μm	150-200 μm
2 mg/l	OK	OK		
20 mg/l	OK	OK		
200 mg/l				
2000 mg/l				

In the table, figures are given by using contaminant nature according to ISO 12103 A3.



IT IS THE USER RESPONSIBILITY TO CHECK ABOUT CORRELATION WITH STANDARD REGARDING CONTAMINANT CHARACTERISTICS (NATURE, DENSITY AND SIZE).

The flow into the suction line connected to port B of the UDA appears only during the UDA suction phase. The suction flow is pulsated with a max peak flow about 25 liters/hour whatever the dosing demand is.

The suction flow pulse frequency increases with the dosing volume.

The suction line with all its accessories as fitting connection has to be designed to be absolutely sealed working in depression.

The return line from port D has to be designed in such way that the return line pressure never exceeds and absolute dynamic pressure of 1,5 bars. If the return line pressure measurement is performed on the installation, the pressure gage has to be able to catch dynamic pressure pulses.



THE UREA FLOW INSIDE THE SUCTION LINE TO PORT B IS MAX. 25 LITERS PER HOUR DEPENDING ON REQUESTED DOSING FLOW

CONTAMINATION COULD PREVENT THE UDA FROM OPERATING

5.2 Air

The UDA is designed to operate with dry clean air coming out from an Air Processing Unit. Maximum temperature of air must be as low as possible to avoid crystals formation.

The UDA air pressure inlet at port A have to be kept between 6 to 10 bars for proper operation.

The UDA could operate with air inlet pressure up to 12 bars peak wise.

Nozzle characteristics as per DBE 567. The nozzle design is under customer's responsibility , nevertheless it has to match with the characteristics as per DBE 567. Changes will request to be tested to see influence on droplet size, air consumption, backpressures,...



AIR SUPPLY FROM APU MUST BE COMPLIANT WITH STANDARD ISO 8573 CLASS 2 FOR DEW POINT AND CLASS 3 FOR OTHERS AIR PROPERTIES

IT IS CUSTOMER RESPONSIBILITY TO STOP THE SYSTEM WHEN AIR PRESSURE IS OUT OF SPECIFIED RANGE

Air Flow consumption for specific application as nozzle or backpressure can be estimated by Emitec on request.

Note that the air flow decrease when the urea flow increase.



AIR IS ALWAYS FLOWING (PERMANENT AIR CONSUMPTION) WHEN THE UDA IS ON DOSING MODE EVEN WHEN THE PUMP IS NOT DOSING UREA

6. Integration specifications

The UDA is a high precision device; all care must be taken:

- To avoid direct exposure to heat radiation from the exhaust pipe and catalyst.
- To avoid mechanical shock or stress during dosing unit handling or assembly.

Dosing unit location see § 2

Grounding and earthing: see caution § 4.1.

The UDA accuracy is very depending on the UDA urea suction line design and operating condition. The UDA suction line connected to the port B as to be fully tight, any leakage at the suction line will give a very big negative impact to the UDA accuracy, the suction line may be under depression while the UDA is sucking.

Due to urea degassing property and the pump operating principle it is from the most importance to avoid all pipe elbows over the port B of the UDA at the suction line connected to port B.

In general matter the UDA integration as to be made in such way that no air can be trapped into the suction pipe.

Please note that the urea degases on it own with time.

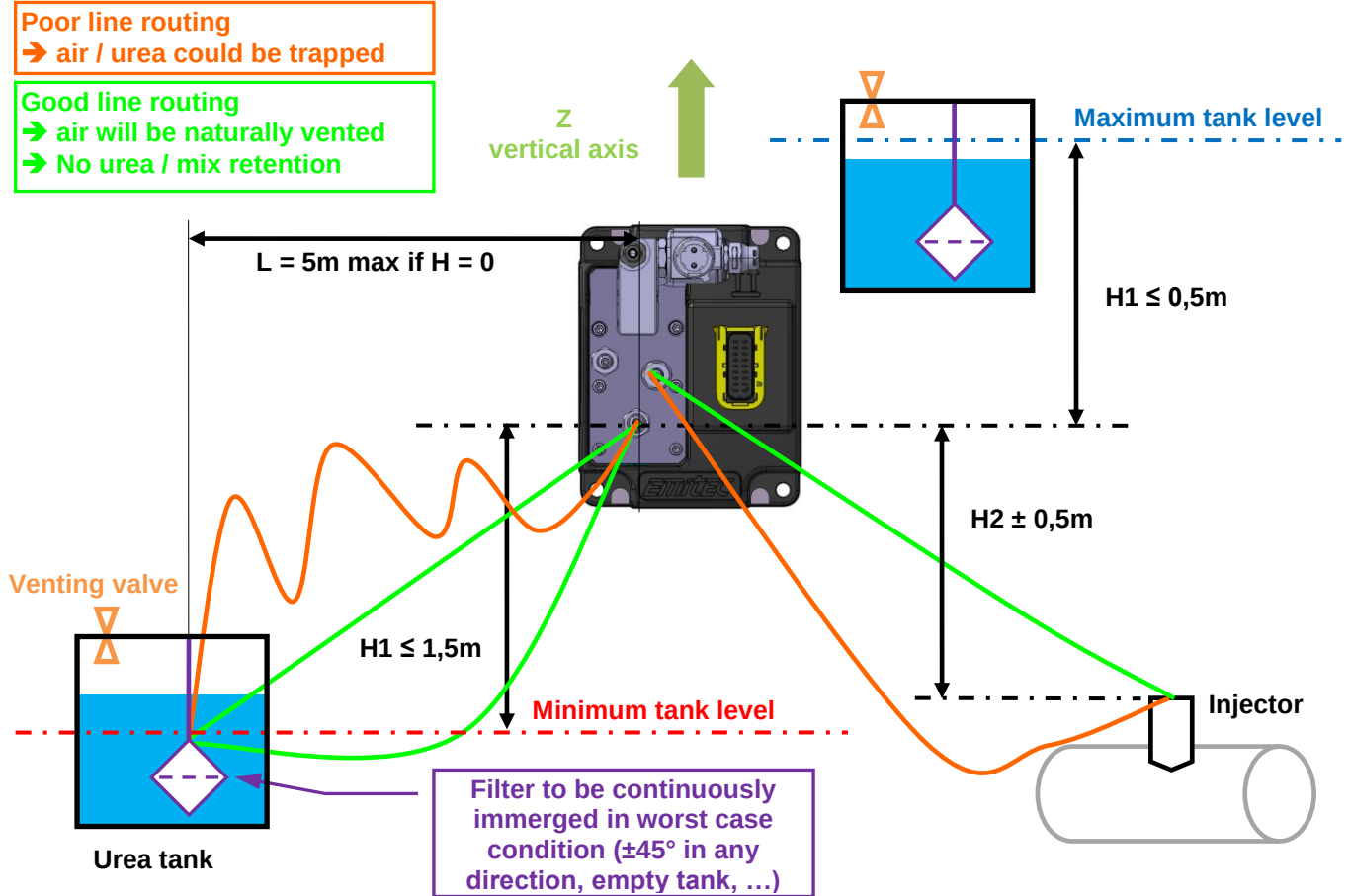
The UDA has to be located over the maximum urea tank level except if the following design is fulfilled.

The length of the suction line has to be as little as possible in order to reduce the effect of degassing.

The use of a foot valve (check valve at the suction pipe end is highly recommended)

The dynamic pressure lost measured at the dosing pump port B has to be kept lower than 50 mbar.

The pressure at dosing port B has to be kept between 800mbar and 1100 mbar absolute including the dynamic pressure lost.



Take contact with Emitec for any other application.



THE DOSER HAS TO BE STOPPED WHEN TANK REACHES THE EMPTY LEVEL TO AVOID POTENTIAL CRYSTALLIZATION RISKS.

7. Performances

The digital electronic doser control makes the UDA extremely fast to achieve the desired flow, within repeatability of 1% of desired volume at steady state standard conditions at which the pump is calibrated as 20°C ambient and liquid temperature for instance.



THE UDA ACCURACY IS DIRECTLY DEPENDENT TO THE HYDRAULIC IMPEDANCE AT THE PUMP INLET; IT IS FROM THE MOST IMPORTANCE TO FULFIL SPECIFICATIONS OF THIS DOCUMENT TO REACH EXPECTED PERFORMANCES.



FOREIGN PARTICLES MAY DRIVES TO INCONSISTANT OPERATION WITH LOW SUCTION CAPACITY AND LOW PERFORMANCES AS REPEATABILITY AND ABSOLUTE FLOW, MALFUNCTION.

7.1 UDA painting

The UDA is designed to accommodate painting, the main frame and the enclosure are made of high-pressure die casting aluminium material.

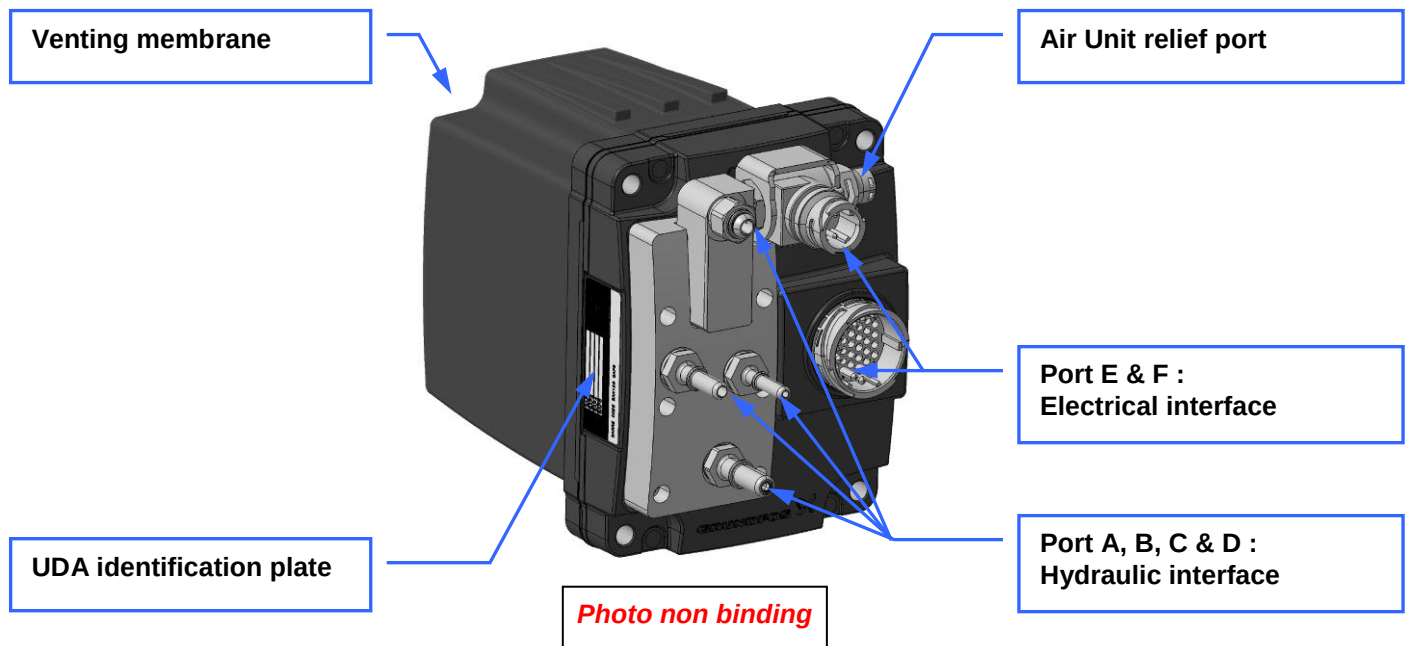


WHEN PAINTING THE UDA, SPECIAL CARE MUST BE TAKEN REGARDING GROUNDING AND EARTHING; SEE CAUTION §4.1



WHEN PAINTING THE UDA ON THE TRUCKS CHASSIS, THE FOLLOWING PARTS MUST BE PROTECTED:

- HYDRAULIC PORTS : A, B, C & D
- ELECTRICAL PORTS: E & F
- VENTING MEMBRANE
- IDENTIFICATION PLATE
- AU RELIEF PORT



7.2 Dismounting and storage from system

Special care must be taken when the UDA is removed from the system.

Dismounting the UDA from the system should start by removing the hydraulic connection B,C & D to avoid pollution with urea into the air inlet port A and the connector receptacles.

The nozzle line could be at air system pressure, insure that not pressurized air is pressurized between a collapsed nozzle and the UDA, release the air pressure before dismounting the air connection to port A and the nozzle connection to port C.

Do not intend to introduce any tools into the UDA hydraulic ports or connector housing, the connector's terminals must be protected with appropriate plastic cap.

Check that no urea can be sprayed over the connector's terminals before removing the electrical connections.

In case of Urea projection, carefully flush the unit with pure medium water to remove the urea and to avoid crystals builds up. Dry the UDA connectors in order to check that no urea crystals are remaining inside the connector receptacle.



WHEN THE UDA HAS BEEN DISMOUNTED INSURE THAT THE UDA IS PROPERLY CLEANED UP BY FLUSHING MEDIUM WATER FROM PORT B TO PORT D.
IN NON OPERATING CONDITON, IT IS VERY IMPORTANT TO SEAL THE 4 UDA POTS A, B, C, & D WITH APPROPRIATE PROTECTIVE CAP TO PROTECT THE UDA FROM EXTERNAL POLLUTION, UREA POLLUTION AND POTENTIAL CRYSTAL BUILD-UP.



THE SOLENOID VALVE COIL MAY BE VERY HOT AND THE CONTACT WITH HUMAN SKIN DURING AND AFTER OPERATION MUST BE AVOIDED



NEVER TRY TO DISMOUNT YOURSELF THE COVER OR ONE OF THE PUMPHEAD SCREWS.
UDA ASSEMBLY REQUIRES USE OF MANY SPECIFIC PROCEDURES AND FACTORY CALIBRATION.

8.Applicable standards

DBE 567 – AA nozzle
DBE 507 - Technical profil
Urea ISO 22241-1
Cleanliness test method ISO 16232
Calibrated sand ISO 12103 A3

9.Labelling

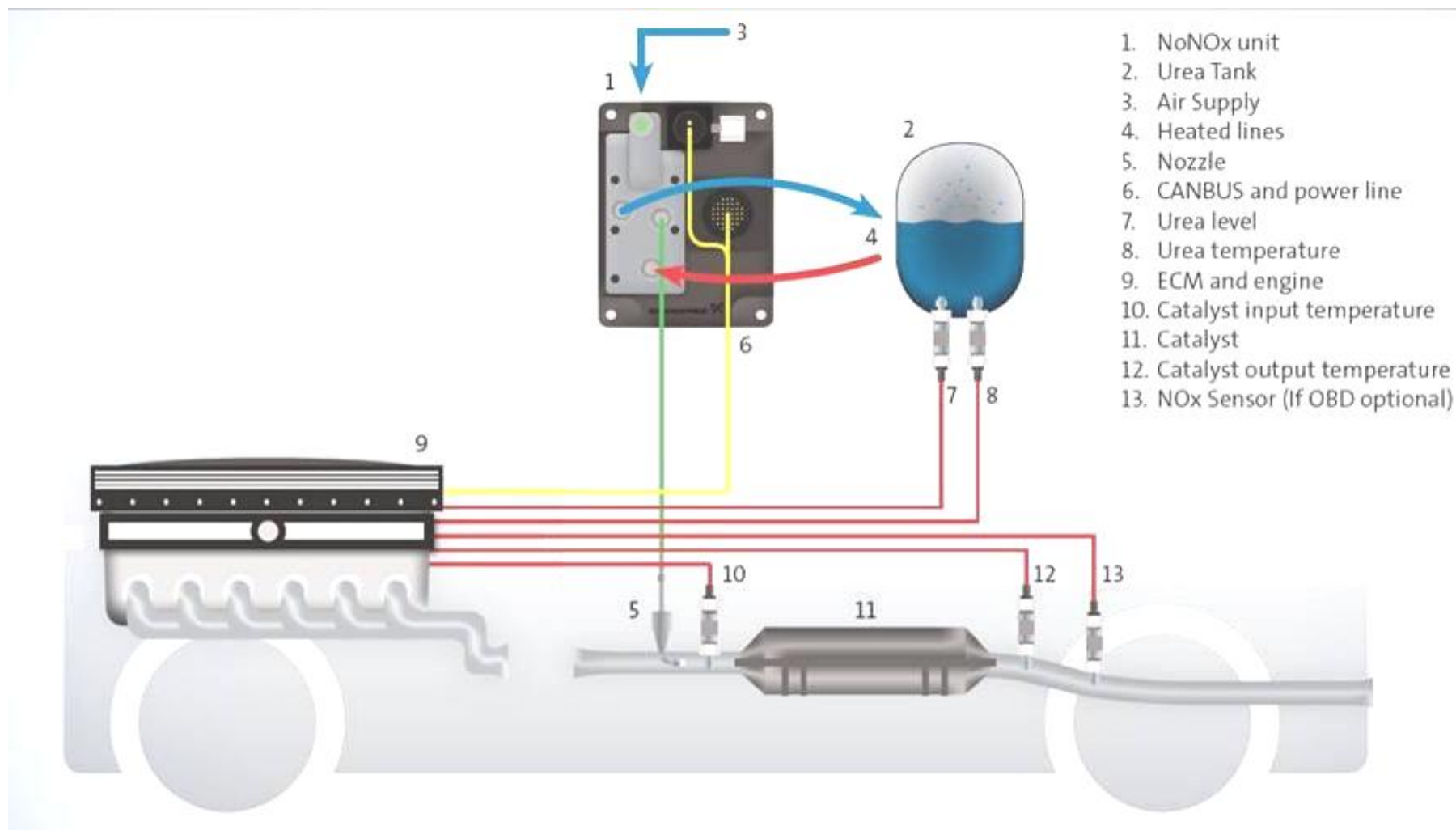
The UDA is labelled on its right side according to SCD.

10. Glossary

ABBREVIATION	DESCRIPTION
UDA	Urea Dosing Air Assisted
UDS	Unit Dosing System
DBE	Document Bureau Etudes
SCD	Source Control Drawing
DU	Drive Unit
ECM	Engineering Change Management
	Engine Control Motor
ECU	Engine Control Unit
APU	Air Processing Unit
LCS	Last Chance Screen
AAV	Air Actuated Valve
SCR	Selective Catalyst Reluctant
IOI	Installation and Operating Instructions

Appendix 1: Variant architecture

1. OEM variant



3. Sensor based variant

