

Post Discharge Venting of Enclosures fitted with Gaseous Fire Suppression Systems

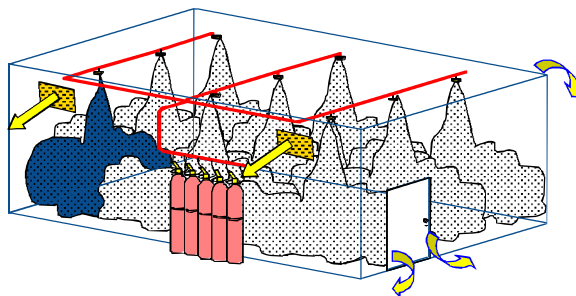


Post Discharge Venting

Introduction

Any hazard to personnel created by the discharge of gaseous extinguishants shall be considered in the design of the system, in particular with reference to the hazards associated with particular extinguishants in the supplementary parts of ISO 14520.

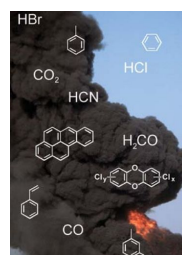
Unnecessary exposure to all gaseous extinguishants shall be avoided.



Adherence to AS ISO 14520 does not remove the user's statutory responsibility to comply with the appropriate safety regulations.

The decomposition products generated by the clean agent breaking down in the presence of very high degrees of heat can be hazardous.

All of the present halocarbon agents contain fluorine. In the presence of available hydrogen (from water vapor, or the combustion process itself), the main decomposition product is hydrogen fluoride (HF).



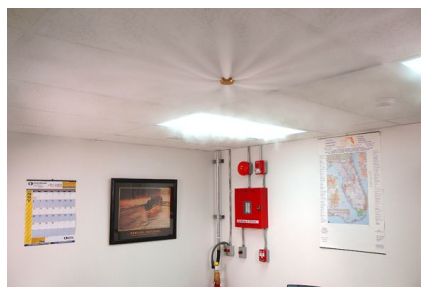
These decomposition products have a sharp, acrid odour, even in minute concentrations of only a few parts per million.

This characteristic provides a built-in warning system for the agent, but at the same time creates a noxious, irritating atmosphere for those who must enter the hazard following a fire.



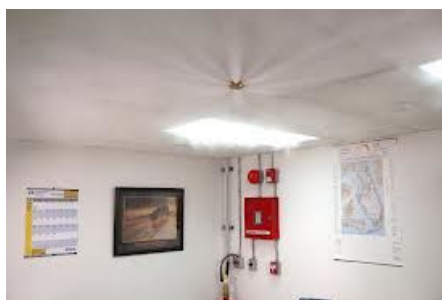
The amount of agent that can be expected to decompose in extinguishing a fire depends to a large extent on the size of the fire, the particular clean agent, the concentration of the agent, and the length of time the agent is in contact with the flame or heated surface.

If there is a very rapid build-up of concentration to the critical value, then the fire will be extinguished quickly and the decomposition will be limited to the minimum possible with that agent.



Should that agent's specific composition be such that it could generate large quantities of decomposition products, and the time to achieve the critical value is lengthy, then the quantity of decomposition products can be quite great.

The actual concentration of the decomposition products then depends on the volume of the room in which the fire was burning and on the degree of mixing and ventilation.



Clearly, longer exposure of the agent to high temperatures would produce greater concentrations of these gases. The type and sensitivity of detection, coupled with the rate of discharge, should be selected to minimize the exposure time of the agent to the elevated temperature if the concentration of the breakdown products is to be minimized.

Non-liquefied agents do not decompose measurably in extinguishing a fire. As such, toxic or corrosive decomposition products are not found.

However, breakdown products of the fire itself can still be substantial and could make the area untenable for human occupancy.



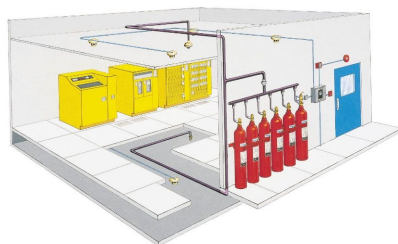
Clean Agents (Synthetic / Manufactured)

- FM200® (25 and 42 bar systems)
- NOVEC 1230™ (25 and 42 bar systems)



Non-liquefied agents (Natural occurring)

- IG-55 (150, 200 and 300 bar systems)
- IG-541 (150, 200 and 300 bar systems)
- IG-100 & IG-01 (150, 200 and 300 bar systems)



The following is an extract from AS ISO 14520.1 Clause 5.3

- h) Means for prompt natural or forced-draft ventilation of such areas after any discharge of extinguishant. Forced-draft ventilation will often be necessary. Care shall be taken to completely dissipate hazardous atmospheres and not just move them to other locations, as most extinguishants are heavier than air.
- i) Instructions and drills of all personnel within or in the vicinity of protected areas, including maintenance or construction personnel who may be brought into the area, to ensure their correct actions when the system operates.

In addition to the above requirements, the following are recommended:

- self-contained breathing apparatus should be supplied and personnel trained in its use;
- personnel should not enter the enclosure until it has been verified as being safe to do so.

The following is an extract from AS ISO 14520.1 Clause 7.9

7.9.1.1 Liquefied extinguishant

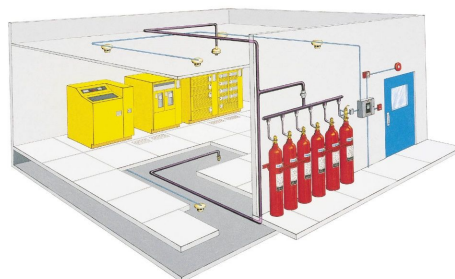
The liquefied extinguishant discharge shall be completed as quickly as possible to suppress the fire and limit the formation of decomposition products. In no case shall the discharge time required to achieve 95 % of the design concentration exceed 10 s at 20 °C, or as otherwise required by the authority.



The following is an extract from AS ISO 14520.1 Clause 5.3

7.9.1.2 Non-liquefied extinguishant

The discharge time required to achieve 95 % of the design concentration for non-liquefied extinguishants shall not exceed 60 s at 20 °C, or as otherwise required by the authority. Flow calculations performed in accordance with 6.3 or with the approved pre-engineered systems instruction manuals shall be used to demonstrate compliance with this.



Design Guidance

1. Document from Fire Industry Association (FIA) UK ***“Guidance on the pressure relief and post discharge venting of enclosures protected by gaseous fire fighting systems”***
2. Calculator Tool.

Calculate Fire Extinguishing (FE) Extraction

Customer: _____
 Project: _____
 Project Address: _____
 Project Role: _____

	Length	Width	Height	Volume (m ³)
1. Room Dimensions	1 000	1 000	500 000	500 000
2. Air Changes	Volume (m ³)	air changes per hour (m ³ /s)		
	500 000	0.139		
3. FE Extraction Requirement	Air/Changes/hr	air changes per hour (m ³ /s)		Total Air Volume required (m ³ /s)
	4	0.139		0.556

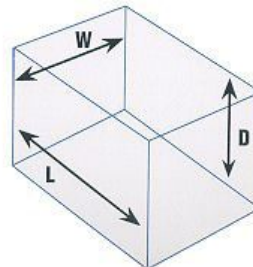
Notes:

1. Four (4) air changes per hour every fifteen (15) minutes
2. In 15 minutes the air in the room will be evacuated, though consideration for ducts voids or corners of the room can hold stale air pockets. It is vitally important that 'Air Make Up' is considered either by entrainment which is opening a window or door or an opening with a damper over it and allowing the extract fan to suck air in by entrainment, or positive fresh air input by a separate fan/filtration unit.
3. AS ISO 14520 - Unnecessary exposure to all gaseous extinguishing agents shall be avoided
4. AS ISO 14520 - Main decomposition product produced by Clean Agents in the presence of very high degrees of heat is hydrogen fluoride (HF)
5. AS ISO 14520 - Means for prompt natural or forced draft ventilation of such areas after discharge of extinguishant. Forced draft ventilation will often be necessary. Care shall be taken to completely dissipate hazardous atmospheres and not just move them to other locations as most extinguishants are heavier than air

Estimating

The following information is required in estimating the requirements for Post Discharge Ventilation:-

1. Room Volume = Length x Width x Height.
2. Number of air changes per hour = four (4)



Estimating

Example:- 500 cubic metre room:-

1. Air volume required = $\frac{500 \text{ cubic metres}}{3600 \text{ seconds}} = 0.139 \text{ m}^3/\text{s}$.
2. $0.139 \text{ m}^3/\text{s}$ = one (1) air change per hour (ACH)
3. Multiply $0.139 \text{ m}^3/\text{s}$ x four (4) air changes per hour (ACH)
4. Total air volume required = $0.555 \text{ m}^3/\text{s}$.
5. Estimate external static pressure (ESP) in Pascals. This is the resistance of air in the floor voids, ducts or grilles.
6. Determine unit location i.e.:- Underfloor or through wall.
7. Select most appropriate unit from selection table.

Estimating

Notes:-

1. The Fire Extinguishing Agent factor of four (4) air changes per hour is consistent for all extinguishing agents (Liquefied and Non Liquefied Agents)
2. Means for **prompt natural or forced draft ventilation**. The four (4) air changes per hour (every 15 minutes) would allow for all of the air in the room to be evacuated, however consideration shall be made for ductwork, voids and corners of the room that may hold stale air pockets.
3. It is important that **air make up** is considered either by entrainment or positive fresh air input by a separate fan/filter unit or Air make up damper (AMD)
4. AMD's are normally closed, monitored **Fire / Smoke dampers** that open simultaneously with the energisation of the Extract Fan Unit

PUMA Fresh Air Input and Fire Extinguishant Extract Units

Model S MK 3 Unit - Under floor model or ducted



- Manufactured from High quality Zintec Mild Steel
- Satin Black Powder coat finish RAL 9005
- Filtration Grade G3-G4 as standard
- Volt Free Contacts for Airflow Indication
- Low Profile Ceiling Mounted or Under floor design
- Electric top up heater with integral control
- Only 152mm high!

Model Q Unit - Through wall mounted

- Linear Aluminium Cover Grille
- Compact High Quality Design
- For Rooms with limited or no void space
- Volt Free Contacts for Airflow Indication
- Through wall mounted design
- Weatherproof Sleeve as standard



PUMA Fresh Air Input and Fire Extinguishant Extract Units

The PUMA range of **FRESH AIR INPUT** and Fire Extinguishant **EXTRACT UNITS** are designed to meet the specific requirements of Electronic Data Processing Areas (EDP), Data Hall or Server Rooms - **QUIETLY** and **EFFICIENTLY**!

FRESH AIR INPUT:- If this area is Air Conditioned, it may need a quantity of Fresh Air for pressurisation and ventilation.

The PUMA units will provide the correct amount of air, filtered and heated to match individual room requirements.

FIRE EXTINGUISHANT EXTRACT:- If this area is fitted with a 'Fire Protection System' utilising any Synthetic or Chemical Agent, it will need a positive extraction unit in the event of discharge.- AS ISO 14520 Part 1.

PUMA Fresh Air Input and Fire Extinguishant Extract Units

The PUMA units will provide these two important functions and when operated together, create an effective ventilated environment to prevent the settling of air/gas discharge or any products of decomposition from a fire, in the room, floor voids and ducts.

They fit comfortably under raised modular floors or discreetly in external walls, ideal when trying to save valuable floor space.

When operated simultaneously with PUMA Air Make Up Dampers (a separate Fire Smoke Damper & Motor) or a matching PUMA Fresh Air Input Unit, the room will be ventilated completely in an efficient manner

For ENERGY efficient operation – we recommend controlling the ventilation with occupancy sensors (PIR) and a simple PUMA Control Panel, together with twin speed controllers, the Fresh Air and Extract Fan Units can be set to 'Trickle ' ventilation on a timer and ' BOOST ' ventilation after a FIRE and Gas release situation.

PUMA Fresh Air Input and Fire Extinguishant Extract Units

Method of operation

Principally all Fresh Air Units will provide filtered, tempered air as required. Control of the heater is via an adjustable thermostat sensing the incoming air, it is factory set to switch the heater on when the ambient temperature falls below 10°C.

Heater protection is provided in the form of an Airflow Failure Switch connected to a heater power relay, this will de-energise if there is insufficient airflow across the Heater Battery. An Element Overheat Thermostat is also fitted.

Both Fresh Air and Fire Extinguishant Extract Units incorporate a Fire/Smoke Damper (FSD) and 240V ac Motor (Actuator) rated to BS EN 1634-1:2008 for 120 minutes.

This FSD is fitted with high temperature silicone blade seals to provide an excellent seal to the room. The FSD is held in the closed position and commences opening simultaneously with the Extract fan and similarly closes when the Fresh Air Unit power is shutdown.

PUMA Fresh Air Input and Fire Extinguishant Extract Units

Installation Data

Model S Units must be located where access to the top panel is not hindered, Bottom Access or Ceiling Mounted versions can be made by inverting the Unit, Controls & Isolator access now on left-hand side. (When ordering denote CM).

Model Q Units when located in external walls or windows, require a Weatherproof Wall Sleeve, this enables the unit to be withdrawn for filter replacement and servicing. Standard depth = 325mm, 475 & 625 available.

Two 3 core cables are provided with FA or FE Only Units. The upper cable supplies the Fresh Air Fan, Heater and FSD, connected through the fitted mains Isolator. This supply will normally be interlocked with the air-conditioning system in relation to power shutdown in the event of fire detection. The lower cable is connected direct to the Fire Extinguishant Extract Fan and FSD, this supply will normally be connected to a 'Fireman's Key Switch' located in the fire detection panel. The last cable is connected to the Airflow Failure Switch for Indication by Volt Free Contacts.

PUMA Fresh Air Input and Fire Extinguishant Extract Units

Room pressure testing & leakage requirements

Room Integrity Testing is conducted in all gas protected areas, AS ISO14520 Part 1 and BS EN 15004—1 2008 regulate this requirement. All rooms are effectively sealed tight and leakage is kept to a minimum to pass this test. The FIA also publish guidelines in this regard.

The Fire/Smoke Dampers fitted to the Puma Units and Air make up Assemblies provide an excellent seal to these wall openings.

In Fresh Air Only & Extract Only Units the Fan & Damper commence opening immediately and opens fully in 75 seconds, on removal of power the Damper will close within 20 seconds.

All applications regarding Fire Integrity must comply with local Authority Regulations. Certified Drawings and Wiring Diagrams available on request.

PUMA Fresh Air Input and Fire Extinguishant Extract Units

Technical Performance & Specification	FRESH AIR INPUT AIR VOLUMES at given					FIRE EXTINGUISHANT EXTRACT VOLUMES at given					FA FAN & ELECTRIC HEATER	FE EXTRACT FAN ONLY	EFFICIENCY	WEIGHT	DIMENSIONS			FAN NOISE LEVELS				
	External Static Pressures (ESP)					External Static Pressures (ESP)									Kg	Lbs	Length (mm)		Width (mm)	Height (mm)	dB(A)	
	0 Pa	25 Pa	50 Pa	75 Pa	100 Pa	0 Pa	50 Pa	75 Pa	100 Pa	kW												Running Current @ 230 V ac 1 PH 50Hz
MODEL NUMBER	0 Pa m³/s	25 Pa m³/s	50 Pa m³/s	75 Pa m³/s	100 Pa m³/s	0 Pa m³/s	50 Pa m³/s	75 Pa m³/s	100 Pa m³/s	kW	Running Current @ 230 V ac 1 PH 50Hz	Running Current @ 230 V ac 1 PH 50Hz	Equivalent A/D BtU/h	G	STD	OPTION	No	Length (mm)	Width (mm)	Height (mm)	dB(A)	
FA 100 S MK 3	0.038	0.034	0.031	0.029	0.024	-	-	-	-	0.75	3.65 A	-	G-3	M6	6	13	400	340	154	48	48	
FA 150 S MK 3	0.048	0.038	0.034	0.032	0.030	-	-	-	-	1.0	4.55 A	-	G-3	M6	6	13	400	340	154	58	58	
FA 200 S MK 3	0.068	0.063	0.060	0.057	0.055	-	-	-	-	1.5	6.81 A	-	G-3	M6	6	13	400	340	154	58	58	
FA 250 S MK 3	0.125	0.116	0.094	0.091	0.086	-	-	-	-	2.0	9.16 A	-	G-4	M6	7	15	400	340	154	59	59	
FA 300 S MK 3	0.14	0.135	0.131	0.125	0.12	-	-	-	-	2.5	12.2 A	-	G-4	M6	7	15	400	340	154	62	62	
FE 100 S MK 3	-	-	-	-	-	0.048	0.040	0.036	0.031	-	-	0.11 A	-	No	-	6	13	400	340	154	38	
FE 150 S MK 3	-	-	-	-	-	0.075	0.068	0.063	0.060	-	-	0.20 A	-	No	-	6	13	400	340	154	48	
FE 200 S MK 3	-	-	-	-	-	0.094	0.084	0.081	0.067	-	-	0.20 A	-	No	-	6	13	400	340	154	58	
FE 250 S MK 3	-	-	-	-	-	0.118	0.094	0.084	0.081	-	-	0.35 A	-	No	-	6	13	400	340	154	60	
FE 300 S MK 3	-	-	-	-	-	0.135	0.125	0.120	0.100	-	-	0.46 A	-	No	-	7	15	400	340	154	59	
FE 350 S MK 3	-	-	-	-	-	0.15	0.140	0.13	0.125	-	-	0.77 A	-	No	-	7	15	400	340	154	62	
FA 80 Q	0.038	0.034	0.031	0.029	0.025	-	-	-	-	0.5	2.32 A	-	G-3	M6	7	15	325	410	185	38	38	
FA 150 Q	0.072	0.058	0.055	0.052	0.050	-	-	-	-	1.5	6.64 A	-	G-3	M6	7	15	325	410	185	53	53	
FA 300 Q	0.144	0.100	0.086	0.074	0.072	-	-	-	-	2.0	8.98 A	-	G-3	M6	7	15	325	410	185	56	56	
FE 100 Q	-	-	-	-	-	0.048	0.040	0.036	0.031	-	-	0.11 A	-	No	-	7	15	325	410	185	48	48
FE 200 Q	-	-	-	-	-	0.094	0.062	0.055	0.048	-	-	0.14 A	-	No	-	7	15	325	410	185	55	55
FE 350 Q	-	-	-	-	-	0.181	0.149	0.100	0.086	-	-	0.28 A	-	No	-	7	15	325	410	185	53	53

Abbreviations:

FA = Fresh Air

FE = Fire Extinguishant Extract

See Large Range Leaflet for Higher External Static Pressures

PE in lieu of FE will denote Permanent Extract i.e. the Extract Fan will run simultaneously with the Input Fan to provide general ventilation for small ducted

Units used for External Static Pressure

(ESP):

Pa = Pascal's m³ = cubic metres per sec-

Fan sound levels are available on Fan Motor Details data sheets (please consult

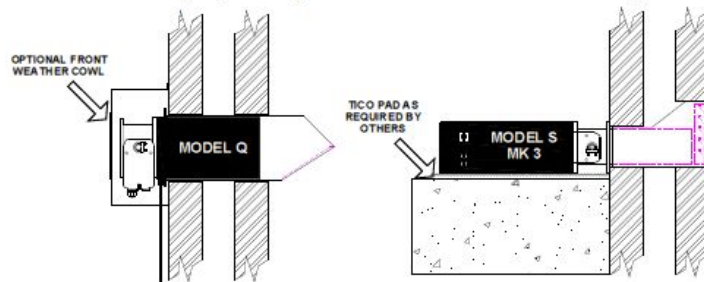
Due to our policy of continued improvement and development, we reserve the right to alter designs and specifications without no-

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PUMA Fresh Air Input and Fire Extinguishant Extract Units

Two Mounting Style Arrangements - Ducted/Underfloor or through Wall/Window



Model S Units may be fitted vertically and ducted to an external wall, the fire/smoke damper must be fitted as close to the wall as possible

Model Q Units are available with Room/Floor Void Extension Duct, this enables simultaneous extract from room and floor void.

PUMA Fire Extinguishant Extract Units / Pressure Relief Dampers

Puma Products Limited has supported the specific requirements of the Data Hall - Server Room - Electronic Data Processing Environment for over 29 years. Located in the South of England, we at Puma are widely recognized as experts in the field of air movement.

Our knowledge and expertise have developed many products - such as Fresh Air Supply and Fire Extinguishant Gas Extract Systems, incorporating Fire/Smoke Dampers. In 1984 we developed the first bespoke range of Fire Extinguishant Gas Extract Units, then in 1999 we developed the first Fire Rated Pressure Relief Dampers to relieve the 'Pulse' pressure spike on the release of high pressure Inert Gas Systems -

The advent of sealed rooms and integrity testing created the need for the **COMBINED FIRE EXTINGUISHANT GAS EXTRACT and PRESSURE RELIEF DAMPER**



Internal View Showing PRD and FE Unit

PUMA Fire Extinguishant Extract Units / Pressure Relief Dampers

Rooms or Enclosures utilising Gaseous Extinguishing Systems such as Inergen, Argon and Nitrogen require OVER pressure relief and positive extract in the event of a discharge. The PUMA range of Combined Fire Extinguishant and Pressure Relief Dampers are designed specifically for that purpose.

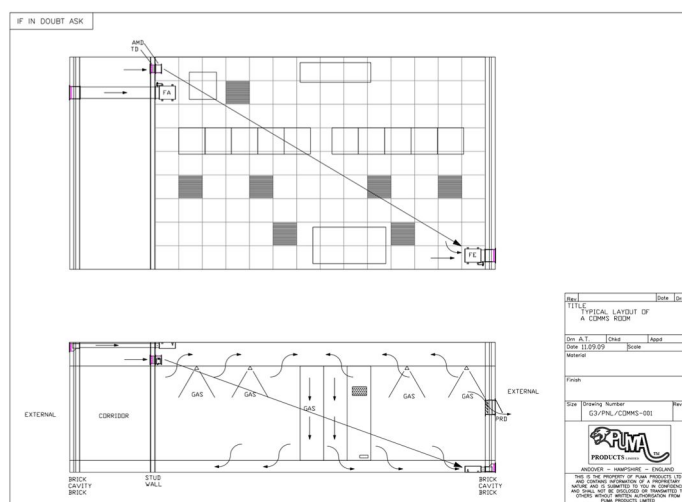
The TWELVE individual models have been designed by matching the closest Free Vent Area Pressure Relief Damper to the most appropriate Gas Extract Fan Unit.

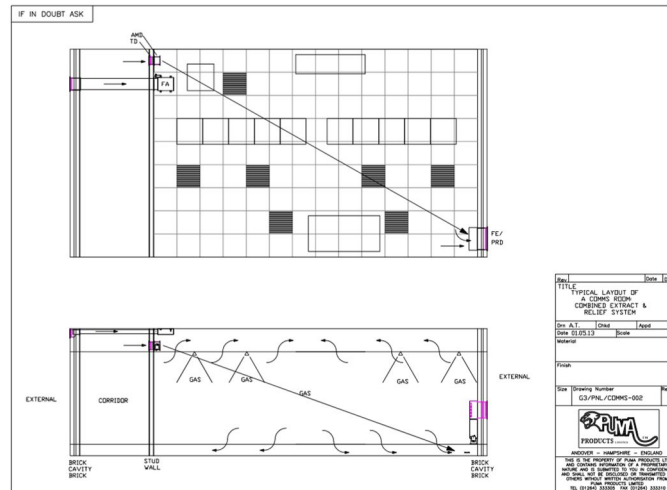
The Fire Smoke Damper and Pressure Relief Damper have been tested by Exova Warrington to BS EN 1634 - 1 2008 - Rated at 2 Hours. All PRD's have Classification to BSEN 13501 E W - 120



External View Showing Weather Louvre

Model Number	Airflow @ 50 PA m³/s	Running Current @ 230 V ac 1PH 50Hz	Weight Kg	Free Vent Area m²	Dimensions in mm		
					D	W	H
FE 250 S MK3 - PRD 150	0.1	0.46 A	15	0.02	154	340	850
FE 350 S MK3 - PRD 225	0.140	0.77 A	17	0.04	154	385	895
FE 250/400 - PRD 300	0.2	0.8 A	36	0.079	250	500	1160
FE 250/600 - PRD 375	0.26	1.2 A	38	0.124	250	535	1195
FE 300/700 - PRD 450	0.34	1.49 A	42	0.178	300	610	1370
FE 300/1400 - PRD 525	0.64	7.6 A	45	0.252	300	685	1445
FE 350/850 - PRD 600	0.4	1.9 A	60	0.317	350	760	1620
FE 350/1000 - PRD 675	0.48	2.3 A	65	0.42	350	835	1695
FE 400/1800 - PRD 750	0.78	4.2 A	80	0.515	415	910	1770
FE 450/2500 - PRD 825	1.2	6.8 A	95	0.622	450	985	1845
FE 550/3600 - PRD 900	1.72	4.3 A**	130	0.713	550	1060	2120
FE 550/4500 - PRD 975	2.05	4.6 A**	135	0.87	550	1135	2195





QUESTIONS ?