XEAMOS

MPAT Propulsion

Reducing emissions together

MPAT - Propulsion

Xeamos solution for Stage V Marine propulsion and auxiliary engines

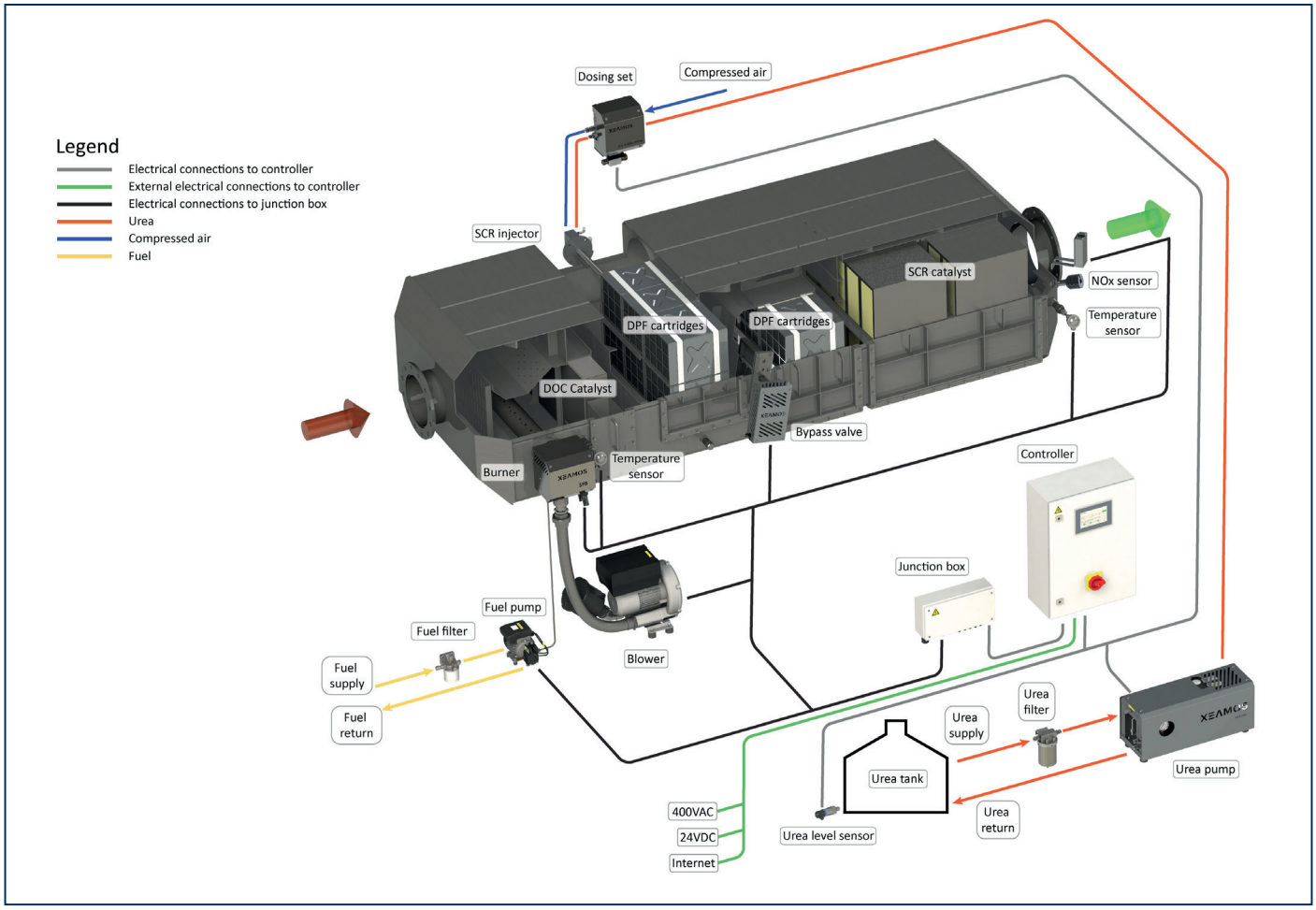
Sailing green' is high on the list of priorities of the inland waterway transportation sector. Not just to meet European directives, (future) national legislation and local environmental measures, but also because key market parties and bodies expect it, port companies encourage it, and public opinion demands it!

Currently, all eyes are mainly focussed on the Stage V emission update of the EU directive for Non-road Mobile Machinery (NRMM) standards which come into force in 2019 and 2020.
With Xeamos MPAT systems any diesel engine can comply with the Stage V emission standard, or even better.

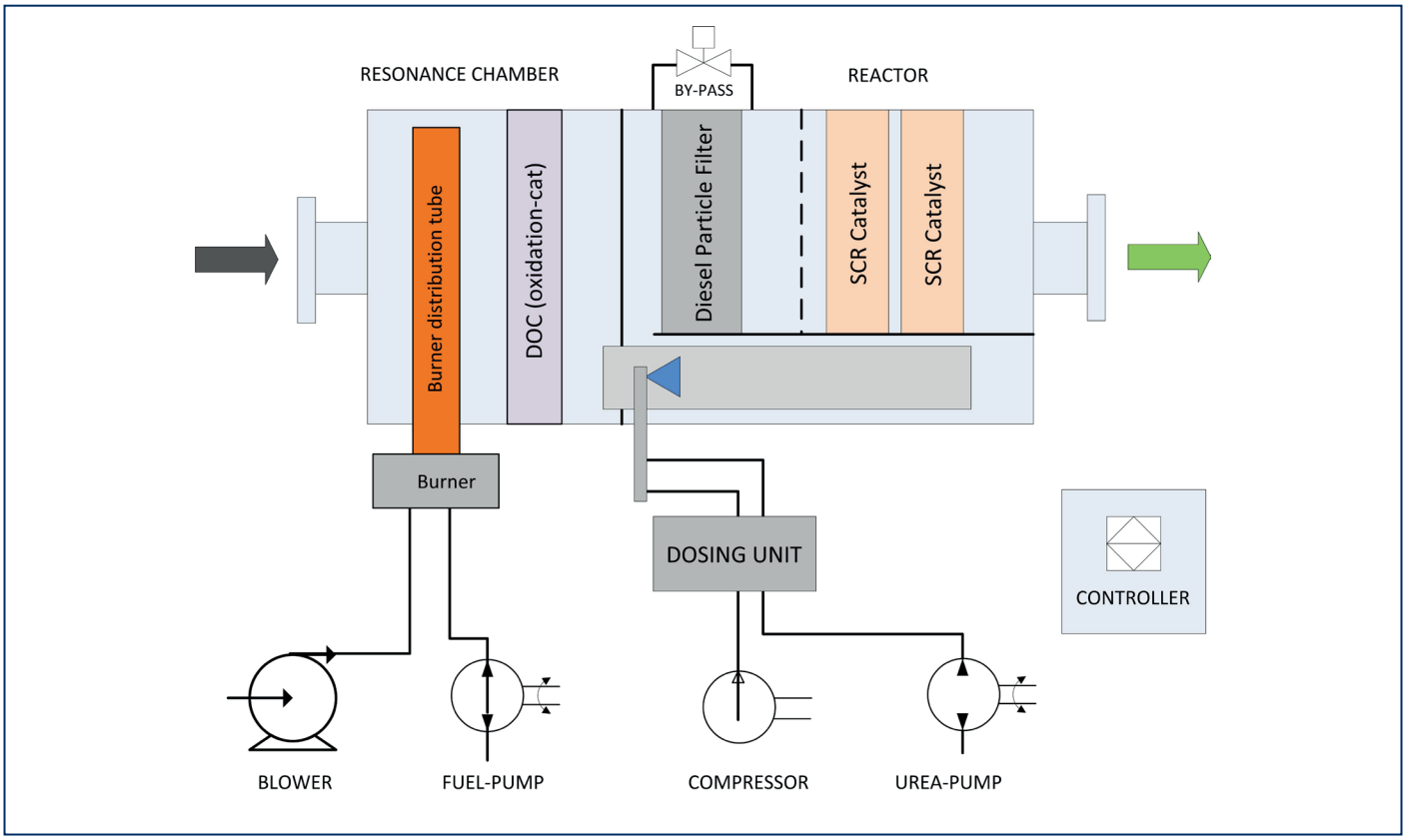
- Combined SCR, DPF (Diesel Particle filters) and silencer
- Meeting Stage V (or EPA Tier 4) emission levels for both refit and new build.
- An automatic safety bypass allows 100% engine availability.
- Long life time of DPF and catalyst
- Compact size. As the urea injector and mixer are integrated in the catalyst housing, the overall installation length is much shorter than any other DPF/SCR combination.
- Multiple engines can be combined at one MPAT system with our unique MEV exhaust valves
- DPF regeneration by fuel burner or electric heater
- The intelligent PLC controller ensures reliable operation

Main features

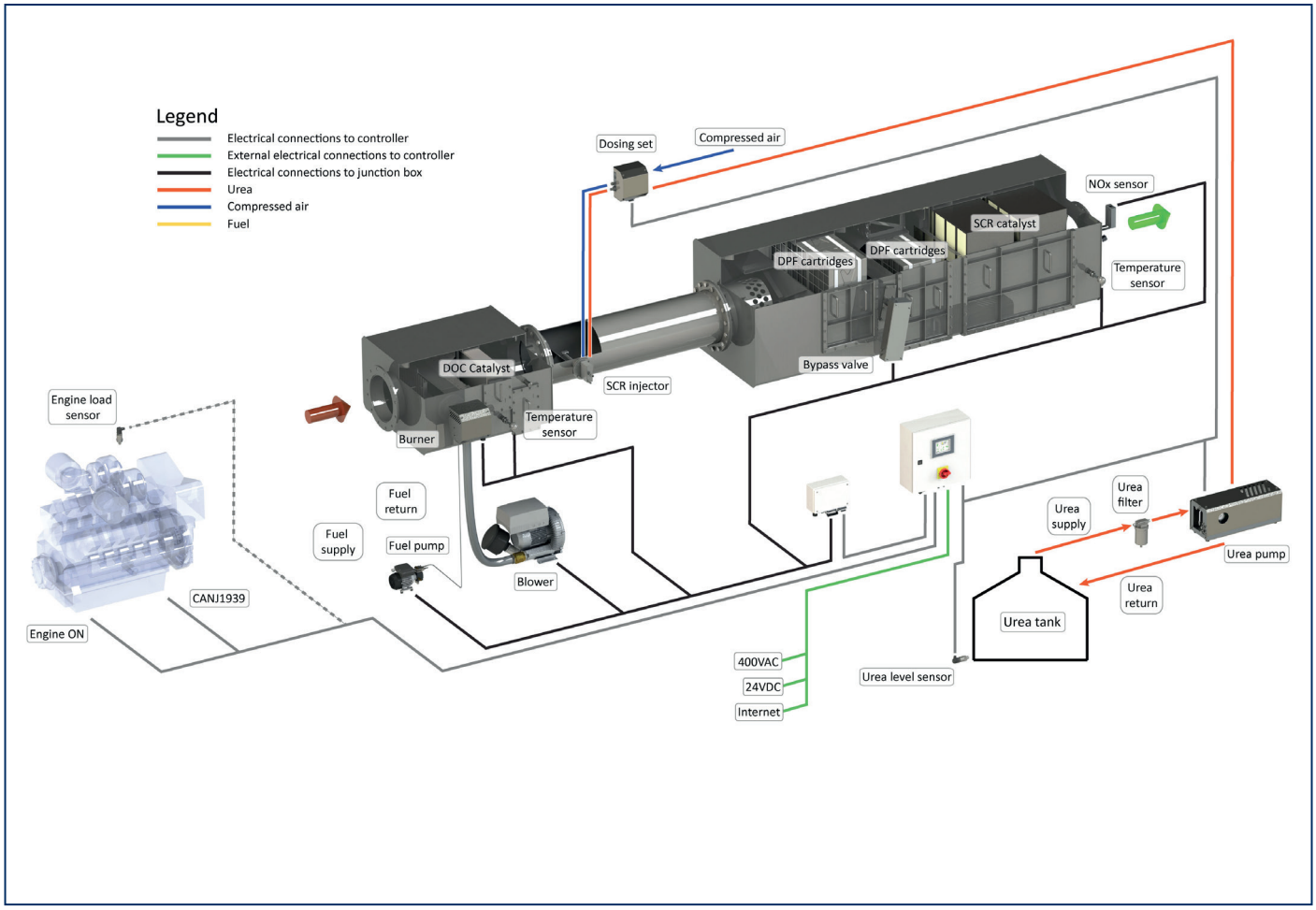
- Unique "All-in-one" design.
- Lowest Cost of Ownership
- Marine quality
- Active regeneration by fuel burner system, or:
- Active regeneration by electric heater (for diesel electric applications)
- Lloyd's Register approved.
- Safety By-pass valve for 100% engine availability.
- Integrated sound attenuation function.



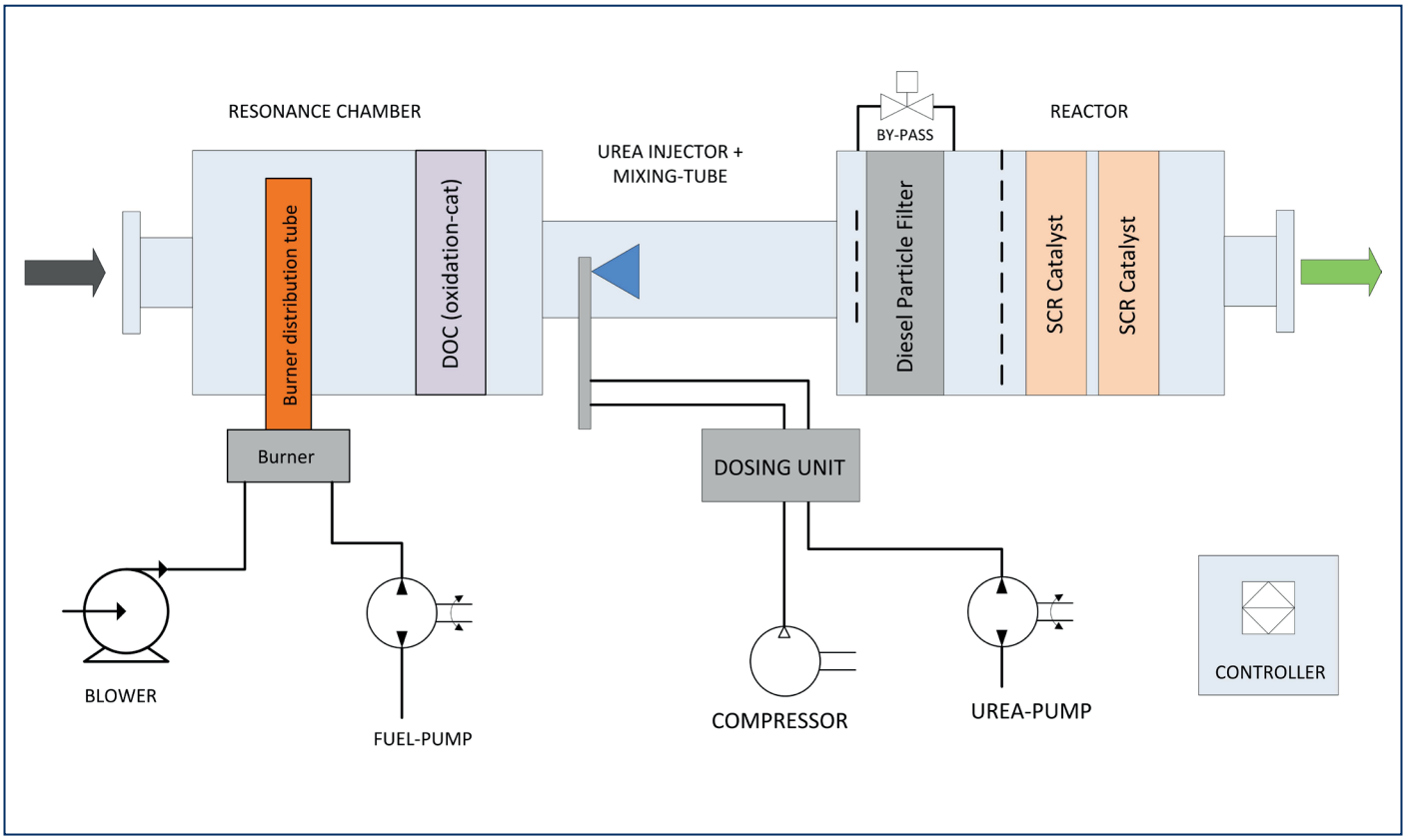
Lay-out of a Compact MPAT system.



Process schematic of a Compact MPAT system.



Lay-out of an In-Line MPAT system.



Process schematic of an In-Line MPAT system.

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Operational conditions

Application	Any EN590 fuel application, mainly marine max 15 ppm Sulphur
Ambient Temperature	-20 + 55°C
Degree of Protection	IP55
Relative humidity	5 to 95% Non-condensing
Inspection & service	Approx. 1x per year interval (normal conditions)

Supplies

AC Power supply	400VAC (4wire) + PE
DC Power supply	24 VDC - 10A (uninterrupted)
Compressed air for urea atomizer	8-15 Nm3/h @ min. 6 barg
Urea specification	AUS32 or AUS40 or equivalent

Design data

Materials Reactor	Housing: 16Mo3 (alt. 235JRG2) Burner tube and shields: High heat resistant steel
Surface treatment	No treatment
Max system pressure	150 mbar (reactor design) - design temperature 520°C
Pressure drop (ΔP)	Approx. 40-60 mbar, clean without soot and ash
DPF type	SiSiC, not coated
DOC	Pt coating, depending on engine type
Emission reduction	NOx ca. 80-90% depending on required reduction
Operational temperature	>220°C (EN590 fuel)
Control strategy	Closed loop with NOx sensor
Supports	Bottom - standard, optional top
Thermal insulation	Blankets or cladded insulation (by yard)

Legal requirements and standards

Standards	EMC directive 2014/30/EU Machinery directive 2006/42/EC Low voltage directive 2014/35/EU Thermo processing EN 746-2 Classification Lloyds Register

System parts

Controller	PLC with full colour HMI, marine standard (acc. to LR requirements) One controller cabinet is applied for up to three MPAT systems per engine room - Inputs: engine load, engine on - Outputs: System ON, Alarm, MOD bus - Data logging - Remote access prepared
Reactor Housing	- Replaces silencer. Contains the DPF Diesel Particle Filter, DOC Diesel Oxidation Catalyst, SCR Selective Catalytic Reduction and Bypass valve Different height/width ratios. - Compact or In-Line depending on available space - Project specific support and positions of in-and outlet
Blower unit	For active burner regeneration, 3 phase motor with FC drive, air filter, check valve, filter service switch
Burner	Fuel burner with flame detection and ignition
Fuel set	Fuel pump with shut-off valves
Electrical heater	In case of regeneration by electrical heater
Urea dosing unit	Controls urea and air flow
Urea pump set	Pressurizes urea. Can feed multiple dosing systems (one pump unit per engine room)
Urea injector	2-phase urea injector, air assisted
Sensors	Temperature & pressure transmitters
Wiring	Wiring by yard on terminals and connectors

Performance

NOx – Nitrogen oxides	> 80 - 90% reduction Standard: NOx out < 1,8 g/kWh Optional: NOx out < 0,4-0,9 g/kWh
PM (measured as PM10)	> 97% reduction
CO/HC reduction	up to 90%
Sound attenuation	40-45 dB(A)

Active regeneration

The particulate mass (PM) or soot is collected in the Diesel Particle Filters (DPF). The Diesel Oxidation Catalyst (DOC) that is fitted before the DPF enables the oxidation of the collected soot to carbon dioxide. This process is called regeneration.
A rule of thumb, for engines that are in a good condition, is when the load profile of the engine is such that the temperature is more than 30% of its running hours below 300°C and never peaks above 380°C active regeneration of the diesel particle filters is required. This means that the exhaust gases are automatically heated for a short period if the exhaust temperature has been too low for a couple of hours.
Xeamos MPAT systems can be supplied with two types of active regeneration: With a fuel burner and with an integrated electrical heater. Electrically regenerated systems are especially designed for diesel-electric or hybrid drive systems. Please contact Xeamos to discuss the best solution for your application.

Optional

- Remote access via LAN accessible for diagnostics/ remote Services
- Alternative power supplies
- Combination of two or three engines at one MPAT system with MEV valve, if possible
- Single controller for each system in case of a two or three engines per engine room
- Alternative in- and outlet positions and flanges

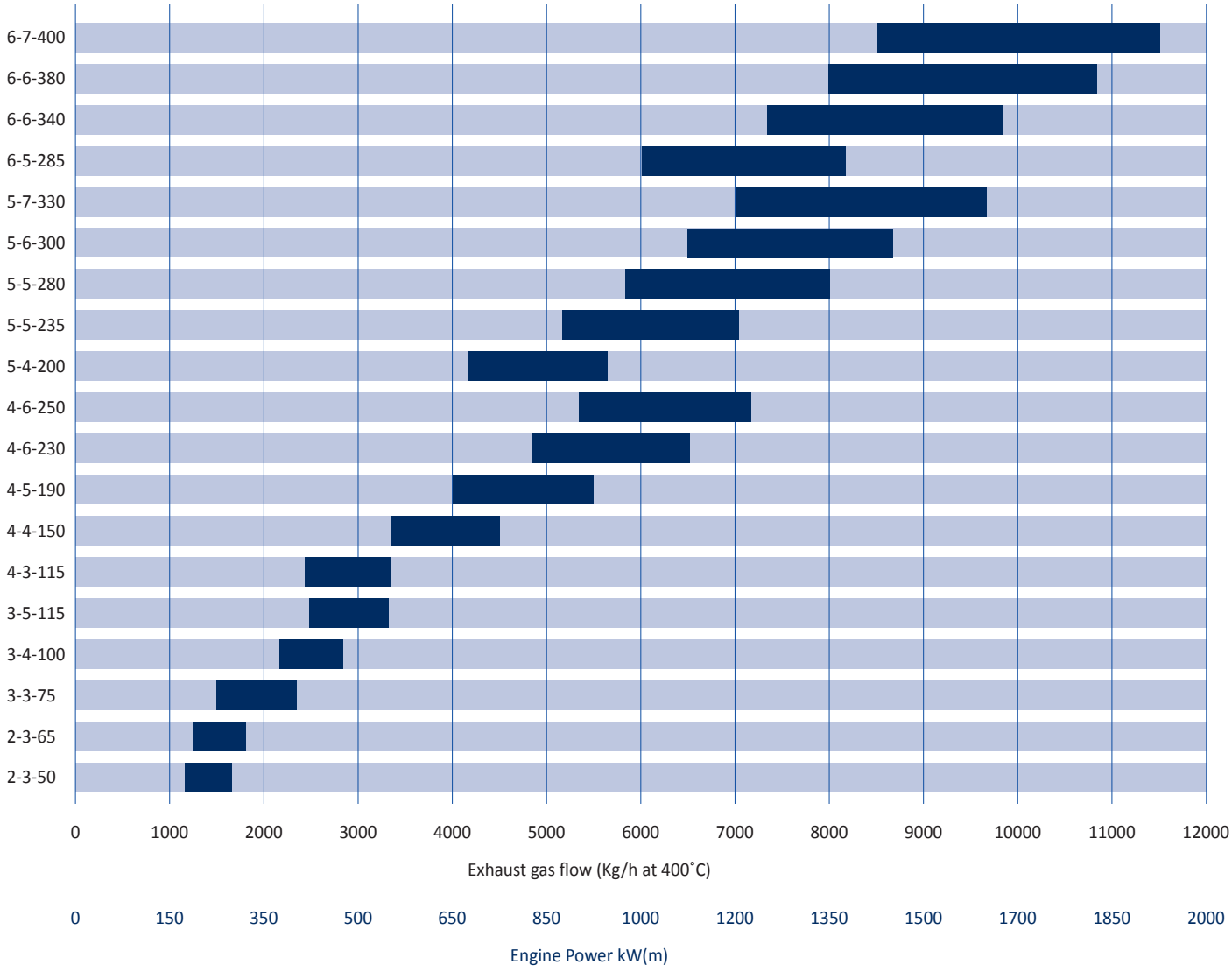
Emission standards

Xeamos MPAT can be supplied to meet emission requirements of various emission standards such as the NRMM Stage V or EPA Tier 4. However, exhaust after treatment systems in general cannot be certified as an stand-alone system. Please contact Xeamos for more information with regards to certification in combination with a specific engine type.

Legend

MPAT	Marine Propulsion After Treatment	HMI	Human Machine Interface
MEV	Multi Engine Valve	PLC	Programmable Logic Controller
DOC	Diesel Oxidation Catalyst	NRMM	Non-Road Mobile Machinery
DPF	Diesel Particle Filter	EPA	Environmental Protection Agency
PM	Particle Mass	CCR	Centrale Commissie voor de Rijnvaart
SCR	Selective Catalytic Reduction		

MPAT System



For indication only, please contact us for exact unit selection or custom solutions.
Bars in graph correspond with 40-60 mbar pressure drop.

Phased installation

Based on the required emission reduction (PM and/or NOx) MPAT systems can be supplied in successive phases:

1. As a silencer replacement unit that is prepared for later installation of SCR and DPF
2. As a combined silencer and SCR system that is prepared for later installation of the DPF system
3. As a complete SCR+DPF system

System combinations

In case there are multiple engines fitted in one engine room it can save space and cost to combine these engines at one MPAT system. This is especially beneficial for engines below 600 kW each. To prevent back flow of exhaust gases if one engine is not operating while others are each engine can be equipped with our unique MEV Multi Engine Valve system.

System selection

To configure your system we ask you to submit the following information.

Engine model, rpm and power	kW
Engine certification	pre CCR / CCR1 / CCR2
Available and allowed backpressure	mbar
Sailing profile	Harbour / ARA / Rhine, etc.
Running hours per year	hours
Average engine load	% (up- and downstream)
Lube oil consumption	l/h (estimate)
Fuel type	if other than EN590

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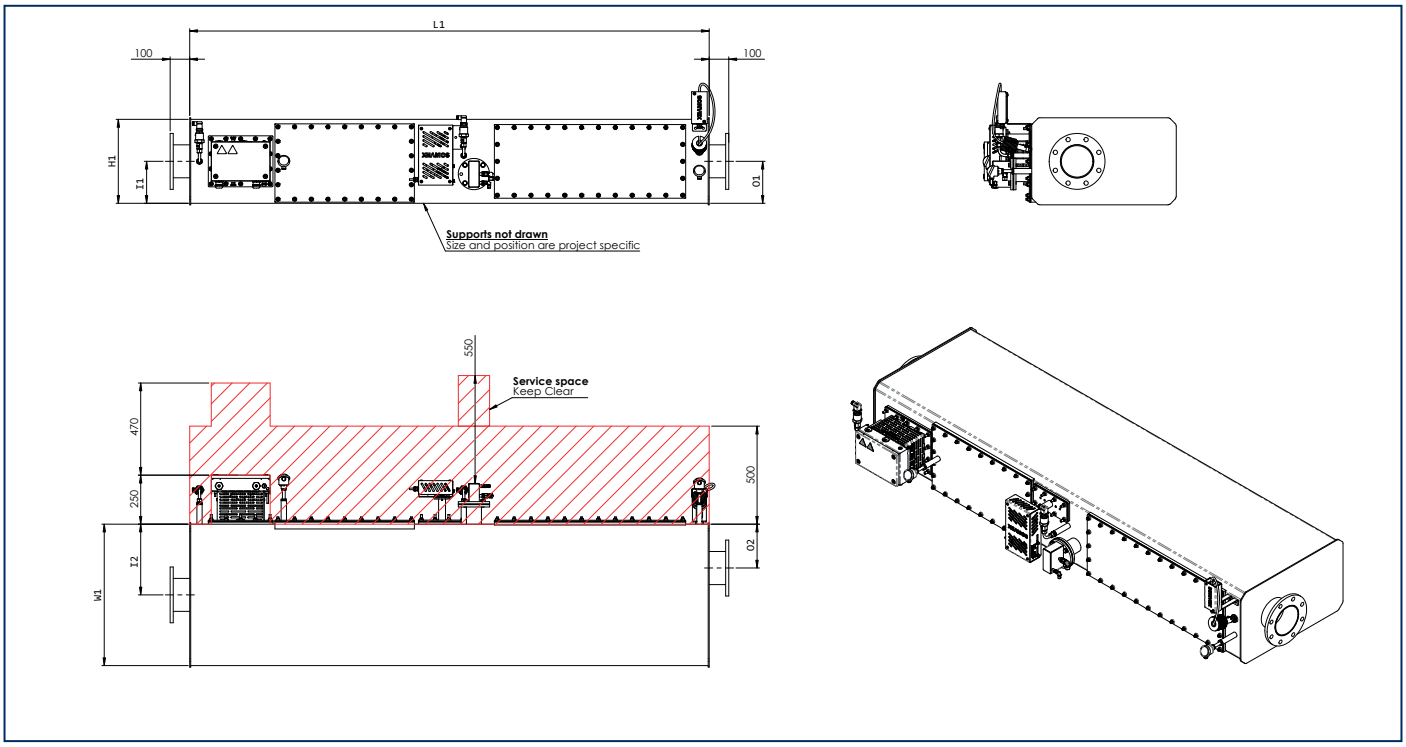
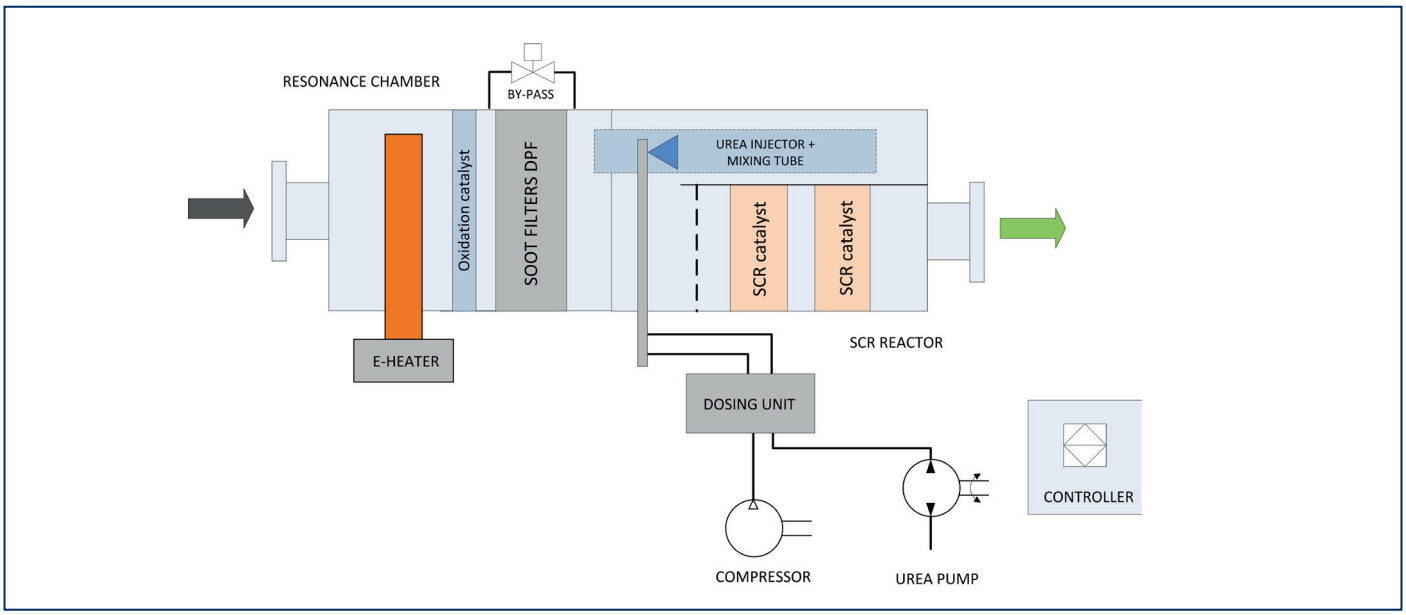
Dimensions & options MPAT system – model 2

Type	E heater	Burner	Flanges EN1092 PN10		Hot oppervlakte	L1	H1	W1	I1	I2	O1	"Gewicht Excl. DPF & SCR"	"Gewicht Incl. DPF & SCR"
	kW	kW	In	Out	m2	mm	mm	mm	mm	mm	mm	kg	kg
2-1-28	10-30	40	DN100	DN125	6,7	1985	430	482	215	241	215	260	380
2-2-40	10-30	40	DN125	DN150	6,7	2250	564	428	282	214	282	400	550
2-2-50	10-30	40	DN125	DN150	6,7	2200	400	800	200	400	200	420	590
2-3-50	10-30	40	DN150	DN150	6,7	2650	430	725	215	365	215	360	515
2-3-65	10-30	40	DN150	DN150	6,7	2650	430	725	215	365	215	370	540



Note: This drawing is preliminary & provided for reference only and is not intended for installation purpose.
Contact us either your local distributor for detailed information.

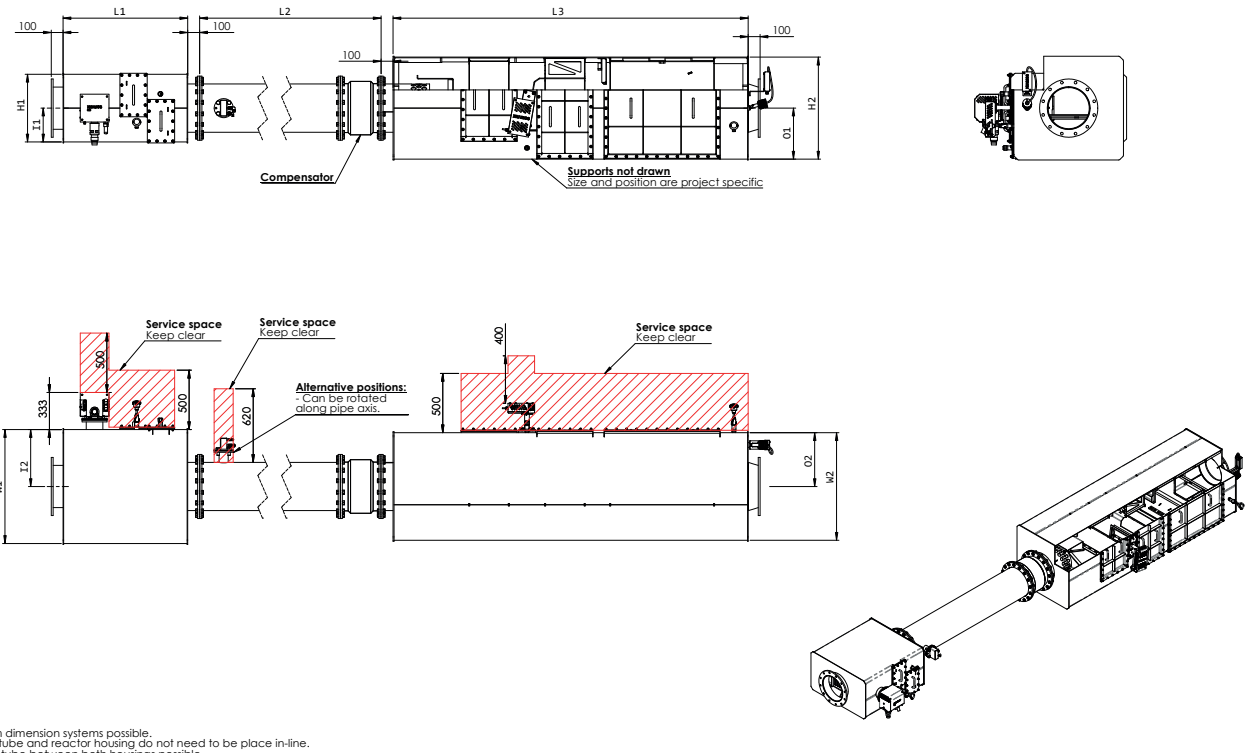


Process schematic of an MPAT-2-3 system.

Remark: Contrary to larger MPAT models,the 2-3 model is based on the DEATS configuration, having only one row of DPF and urea injection after the DPF. As a standard these models are supplied as a passive system or with electrical regeneration. The required power for electrical regeneration depends on the engine model and expected load profile, as well as the available on-board power.

Dimensions & options MPAT system – in-line version

Type	E heater	Burner	Flanges EN 1092 PN10		Hot surface	L1	L2	L3	H1	H2	W1	W2	I1	I2	O1	O2	"Weight Excl. DPF & SCR"	"Weight Incl. DPF & SCR"
	kW	kW	In	Out	m2	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	kg
3-3-75	20-45	40	DN200	DN200	9,6	900	1100	2795	360	555	665	510	180	333	278	258	570	800
3-4-100	20-45	50	DN250	DN250	11,2	900	1400	2795	360	555	710	665	180	355	278	333	600	900
3-5-115	30-50	50	DN250	DN250	12,8	900	1400	2795	360	555	865	825	180	433	278	425	650	1010
4-3-115	30-50	60	DN250	DN250	11,4	900	1400	2895	585	705	460	510	292	258	257	272	1120	1450
4-4-150	30-50	60	DN300	DN300	13,1	900	1650	2895	585	705	510	665	292	255	331	332	1170	1600
4-5-190	60	70	DN300	DN300	14,8	900	1650	2895	585	705	665	835	292	333	416	417	1360	1900
4-6-230	60	70	DN400	DN400	17,6	900	2200	2895	585	705	865	985	292	433	350	465	1510	2150
4-6-250	60	70	DN400	DN400	19	1050	2200	2895	585	705	960	1080	292	480	350	540	1620	2300
5-4-175	60	70	DN350	DN350	15,6	900	1950	2995	585	860	710	670	292	355	430	332	1550	2070
5-4-200	60	80	DN350	DN350	16,3	900	1950	2995	585	860	710	765	292	355	430	380	1660	2250
5-5-245	60	80	DN400	DN400	19,3	1050	2200	2995	585	860	960	910	292	480	430	455	1850	2530
5-5-280	n/a	80	DN400	DN400	19,3	1050	2200	2995	585	860	960	910	292	480	430	455	1840	2570
5-6-300	n/a	80	DN450	DN450	21,9	1200	2500	2995	585	860	1165	985	292	583	430	492	1910	2750
5-7-330	n/a	80	DN450	DN450	23,3	1200	2500	2995	585	860	1165	1140	292	583	430	582	2010	2950
6-5-285	n/a	100	DN400	DN400	20	1050	2500	2995	585	1015	960	835	292	480	505	417	2145	2950
6-6-340	n/a	100	DN450	DN450	23,6	1200	2500	2995	865	1015	965	985	432	483	505	465	2230	3200
6-6-380	n/a	120	DN450	DN450	24,4	1200	2500	2995	865	1015	965	985	432	483	505	540	2380	3400
6-7-445	n/a	120	DN500	DN500	25,8	1200	2750	2995	865	1015	965	1155	432	483	505	575	2470	3600



* Custom dimension systems possible.
* Mixing tube and reactor housing do not need to be place in-line.
* Longer tube between both housings possible.

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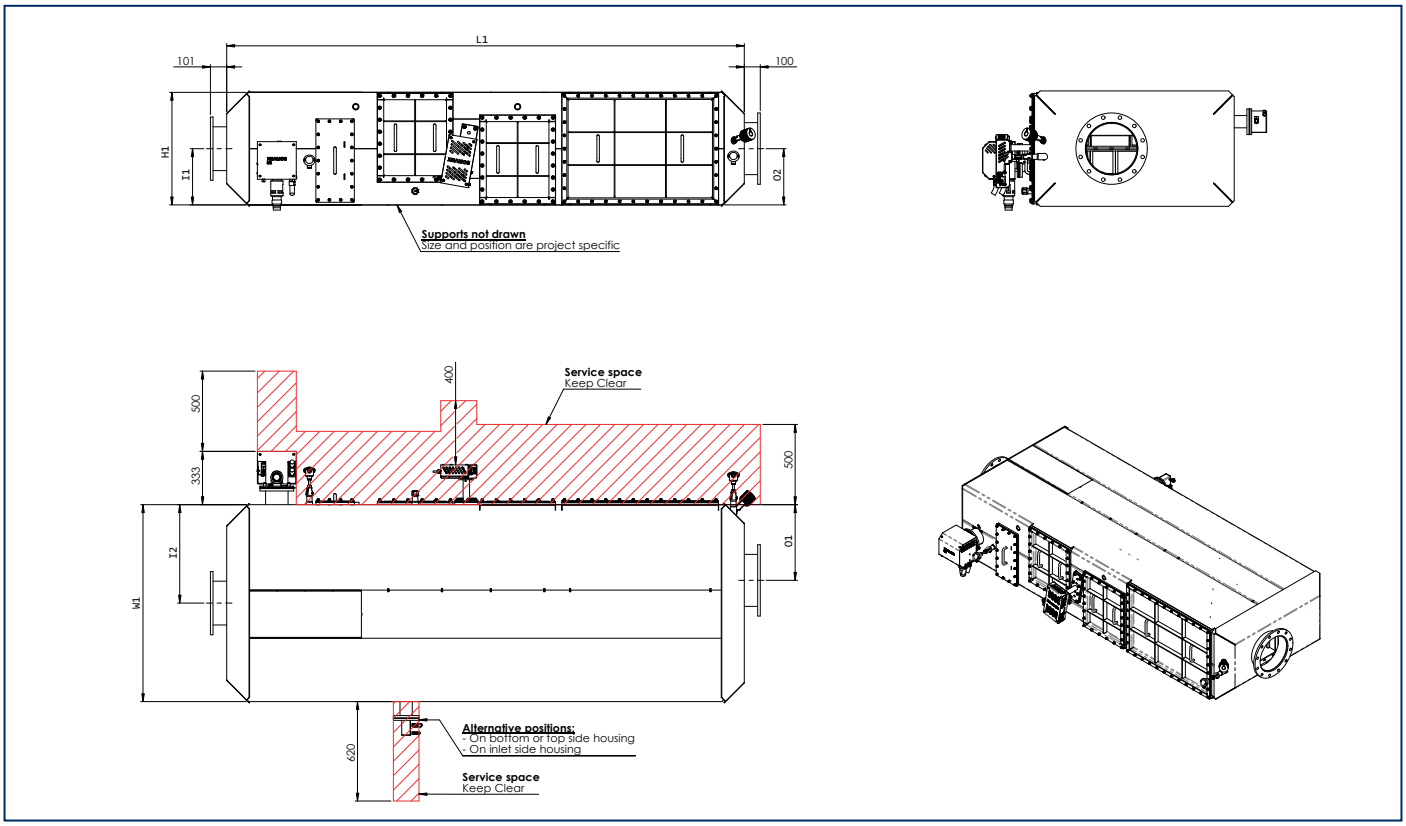
Dimensions & options MPAT system - compact version

Type	E heater	Brander	Flenzen EN1092 PN10		Hot surface	L1	H1	W1	I1	I2	O1	O2	"Gewicht Excl. DPF & SCR"	"Gewicht Incl. DPF & SCR"
	kW	kW	In	Out	m2	mm	mm	mm	mm	mm	mm	mm	kg	kg
3-3-75	20-45	40	DN200	DN200	9,2	3000	555	805	280	410	280	260	720	880
3-4-100	20-45	50	DN250	DN250	10,2	3000	555	975	280	485	280	335	800	980
3-5-115	30-50	50	DN250	DN250	11,4	3000	555	1140	280	570	280	415	860	1090
4-3-115	30-50	60	DN250	DN250	11,4	3230	705	875	350	440	350	260	770	1100
4-4-150	30-50	60	DN300	DN300	12,6	3230	705	1020	350	510	350	335	870	1300
4-5-190	60	70	DN300	DN300	14,2	3230	705	1230	350	615	350	415	1210	1750
4-6-230	60	70	DN400	DN400	15,9	3230	705	1485	350	725	350	495	1310	1950
4-6-250	60	70	DN400	DN400	17,5	3230	705	1655	350	825	350	495	1420	2100
5-4-175	60	70	DN350	DN350	14,4	3330	860	1080	430	515	430	335	1200	1720
5-4-200	60	80	DN350	DN350	15,2	3330	860	1170	430	565	430	335	1310	1900
5-5-245	60	80	DN400	DN400	15,8	3330	860	1365	430	600	430	415	1150	1950
5-5-280	n/a	80	DN400	DN400	15,8	3330	860	1365	430	600	430	415	1170	2200
5-6-300	n/a	80	DN450	DN450	18,8	3330	860	1460	430	780	430	495	1460	2300
5-7-330	n/a	80	DN450	DN450	19,2	3330	860	1610	430	805	430	570	1460	2400
6-5-285	n/a	100	DN400	DN400	17,5	3330	1015	1290	505	620	505	415	1370	2170
6-6-340	n/a	100	DN450	DN450	18,4	3330	1015	1435	505	740	505	495	1470	2440
6-6-380	n/a	120	DN450	DN450	19,2	3330	1015	1435	505	740	505	495	1580	2600
6-7-400	n/a	120	DN500	DN500	20,1	3330	1015	1610	505	770	505	570	1770	2900



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