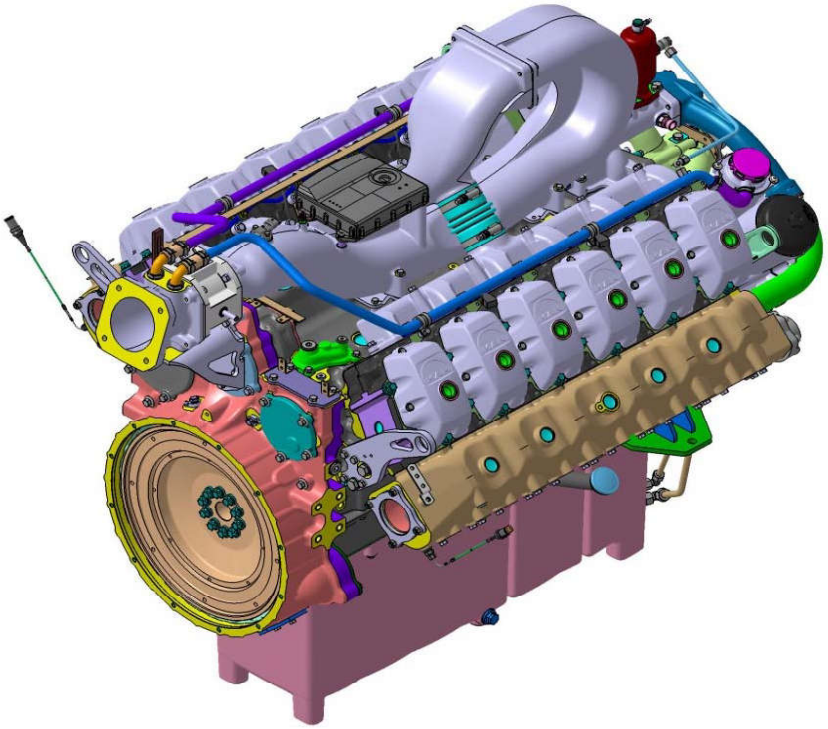
Preliminary Technical Data



Since our products are in continuous development,
we reserve the right to make technical modifications.

	Date	Signature	No. of Assembly Drawing
Created	24.07.2014	Mz	
Released	24.07.2014	Kn	

Natural Gas Engine E 3262 E 302

Technical Data

Principle:

Engine width:	mm	1245	in	49,02
Engine length:	mm	1743	in	68,62
Engine height:	mm	1494	in	58,82
Engine weight, dry:	kg	1763	lb	3887

No. of cylinders:	V-12 engine
Cylinder head:	Cylinder head with 4 valves, sintered exhaust valve guides
Piston:	Compression ratio 12:1
Cylinder liner:	Wet cylinder liners
Camshaft:	Camshaft hardened by induction
Crankshaft:	Forged crank with balance weights, damper
Flywheel housing:	SAE 1
Exhaust pipe:	Watercooled exhaust manifolds
Engine cooling:	Without engine cooling pump, coolant to be circulated by external water pump with temperature control
Lubrication:	Pressure lubrication by gear-driven pump, exchangeable lube-oil filter in full flow and lube oil cooler integrated in engine coolant circuit
Oilsump / oil volume:	max. 102 l
Spark plugs:	Special spark plugs for industrial gas engines
Starter motor:	Pre-engaged-drive starter 24 V - 7,0 kW

No. of Assembly Drawing: 51.00508-7133

	Date	Signature	No. of Assembly Drawing
Created	24.07.2014	Mz	
Released	24.07.2014	Kn	

Technical Data

Engine Data		**50 Hz**		
		METRIC		ENGLISH
Rated speed	rpm	1500	rpm	1500
ISO standard power (COP)	kW	275	bhp	369
Engine Torque max. (ISO 1585) at rated speed	Nm	1751	Nm	1751
Air ratio	λ	1,0	λ	1,0
Configuration		V-engine		
No. of cylinders		12		12
Bore	mm	132	in	5,20
Stroke	mm	157	in	6,18
Swept volume	l	25,8	cu in	1574
Direction of rotation looking on flywheel		left		left
Flywheel housing		SAE 1		SAE 1
Ring gear with number of teeth	Z	137	Z	137
Compression ratio	ε	12:1	ε	12:1
Mean effective pressure	bar	8,5	psi	123,3
Mean piston speed	m/s	7,85	in/s	309,1
Lube oil consuption up to	kg/h		lb/hr	
Lube oil filling quantity min. / max.	l	42 / 102	US gal	11 / 27
Coolant filling quantity	l	48	US gal	12,68
Max. operating pressure	bar	3	psi	0,79
Min. engine coolant circulation quantity	l/min	579	US gal/min	152,96
Coolant temperature min.	°C	80	°F	176
Coolant temperature max.	°C	88	°F	190,4
Difference (inlet - outlet max.), crankcase	K	6	K	6
Pressure loss gas mixer	mbar	8	psi	0,12
Suction pressure max. (before gas mixer)	mbar	5	psi	0,07
Gas flow pressure min.	mbar	30	psi	0,44
Exhaust back pressure max.	mbar	40	psi	0,58

Lube oil to MAN works standard M 3271-2 and coolant to MAN works standard MAN 324 NF

Gas quality to MAN data sheet - minimum requirement for the gas quality for MAN gas engines

Air ratio measured by lambdameter ETAS LA 4_E

	Date	Signature	No. of Assembly Drawing
Created	24.07.2014	Mz	
Released	24.07.2014	Kn	

Technical Data

Engine Data		60 Hz METRIC		ENGLISH
Rated speed	rpm	1800	rpm	1800
ISO standard power (COP)	kW	300	bhp	402
Engine Torque max. (ISO 1585) at rated speed	Nm	1592	Nm	1592
Air ratio	λ	1,0	λ	1,0
Configuration		V-engine		
No. of cylinders		12		12
Bore	mm	132	in	5,20
Stroke	mm	157	in	6,18
Swept volume	l	25,8	cu in	1574
Direction of rotation looking on flywheel		left		left
Flywheel housing		SAE 1		SAE 1
Ring gear with number of teeth	Z	137	Z	137
Compression ratio	ε	12:1	ε	12:1
Mean effective pressure	bar	7,8	psi	113,1
Mean piston speed	m/s	9,42	in/s	370,9
Lube oil consuption up to	kg/h		lb/hr	
Lube oil filling quantity min. / max.	l	42 / 102	US gal	11 / 27
Coolant filling quantity	l	48	US gal	12,68
Max. operating pressure	bar	3	psi	0,79
Min. engine coolant circulation quantity	l/min	634	US gal/min	167,49
Coolant temperature min.	°C	80	°F	176
Coolant temperature max.	°C	88	°F	190,4
Difference (inlet - outlet max.), crankcase	K	6	K	6
Pressure loss gas mixer	mbar	10	psi	0,15
Suction pressure max. (before gas mixer)	mbar	6	psi	0,09
Gas flow pressure min.	mbar	30	psi	0,44
Exhaust back pressure max.	mbar	40	psi	0,58

Lube oil to MAN works standard M 3271-2 and coolant to MAN works standard MAN 324 NF

Gas quality to MAN data sheet - minimum requirement for the gas quality for MAN gas engines

Air ratio measured by lambdameter ETAS LA 4_E

	Date	Signature	No. of Assembly Drawing
Created	24.07.2014	Mz	
Released	24.07.2014	Kn	

Technical Data

Rating Data*			**50 Hz**	
λ = 1.0			METRIC	
Load	%	100	75	50
Ignition timing	grad	22	22	22
ISO standard rating	kW	275	206	137
Coolant heat	kW	218	190	156
Exhaust heat up to 120 °C	kW	157	116	79
Radiation heat max.	kW	10	7	6
Energy input	kW	694	546	397
Fuel Consumption	MJ/kWh	9,09	9,54	10,43
Efficiency*				
mechanical	%	39,6	37,7	34,5
thermal	%	54,0	56,0	59,2
total	%	93,6	93,7	93,7
Mass flows				
Combustion air	kg/h	852	670	488
Fuel	kg/h	50,0	39,3	28,6
Exhaust gas mass flow rate, wet	kg/h	902	709	517
Exhaust gas mass flow rate, dry**	Nm³/h	731	575	418
Coolant mass flow rate	kg/h	35661		
Temperatures				
Exhaust gas temperature max.	°C	611		
Emissions				
NO_X	ppm	< 3500		
CO	ppm	< 4500		
HCHO	ppm	< 5		
NMHC	ppm	< 100		
HC	ppm	< 1600		
Engine surface noise	dB (A)	107	Total acoustic power	
Exhaust sound power level	dB (A)	128,0	Total acoustic power	
Reference surface	dB (A)	12,1	(exhaust)	

Reference gas mixing unit: Motortech VariFuel2 and ignition system MIC 4

* The technical data are based on natural gas with a calorific value of 10 kWh/Nm³ and a methane no. > 80

The efficiency data are calculated by means of the ISO standard power acc to DIN ISO 3046-1

Standard conditions: Atmospheric pressure absolute: 100 kPa
Air temperature 25 °C
Relative air humidity 30 %

The measured efficiency data are: 38,2 %, 36,4 %, 33,2 % (mechanical at 100, 75 and 50 % load) at following conditions:

Installation location height: 310 m above sea level, atmospheric pressure absolute: 97,0 kPa, inlet air temperature: 25 °C, relative air humidity: 30 %

Rating adaptation at ambient conditions acc to DIN ISO 3046-1

The tolerance for the usable heat is ±7 % at rated output

The coolant data are based on a 45 % portion of antifreeze

** Standard conditions TA-Luft: Temperature 0°C, Pressure absolute: 100 kPa

	Date	Signature	No. of Assembly Drawing
Created	24.07.2014	Mz	
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Technical Data

Rating Data*			**50 Hz**	
λ = 1.0			ENGLISH	
Load	%	100	75	50
Ignition timing	°BTDC	22	22	22
ISO standard rating	Btu/min	15639	11715	7791
Coolant heat	Btu/min	12397	10805	8872
Exhaust heat up to 120 °C	Btu/min	8928	6597	4493
Radiation heat max.	Btu/min	569	398	341
Energy input	Btu/min	39467	31050	22577
Fuel Consumption	Btu/bhp-hr	517	543	593
Efficiency*				
mechanical	%	39,6	37,7	34,5
thermal	%	54,0	56,0	59,2
total	%	93,6	93,7	93,7
Mass flows				
Combustion air	lb/hr	1878	1477	1076
Fuel	lb/hr	110	87	63
Exhaust gas mass flow rate, wet	lb/hr	1989	1564	1139
Exhaust gas mass flow rate, dry*	Nm³/h	777	601	437
Coolant mass flow rate	lb/hr	78619		
Temperatures				
Exhaust gas temperature max.	°F	1132		
Emissions				
NO_X	ppm	< 3500		
CO	ppm	< 4500		
HCHO	ppm	< 5		
NMHC	ppm	< 100		
HC	ppm	< 1600		
Engine surface noise	dB (A)	107	Total acoustic power	
Exhaust sound power level	dB (A)	128,0	Total acoustic power	
Reference surface	dB (A)	12,1	(exhaust)	

Reference gas mixing unit: Motortech VariFuel2 and ignition system MIC 4

* The technical data are based on natural gas with a calorific value of 10 kWh/Nm³ and a methane no. > 80

The efficiency data are calculated by means of the ISO standard power acc to DIN ISO 3046-1

Standard conditions: Atmospheric pressure: 14,7 psi

Air temperature 77 °F

Relative air humidity 30 %

The measured efficiency data are: 38,2 %, 36,4 %, 33,2 % (mechanical at 100, 75 and 50 % load) at following conditions:

Installation location height: 1017 ft above sea level, atmospheric pressure absolute: 14,0 psi, inlet air temperature: 77 °F, relative air humidity: 30 %

Rating adaptation at ambient conditions acc to DIN ISO 3046-1

The tolerance for the usable heat is ±7 % at rated output

The coolant data are based on a 45 % portion of antifreeze

** Standard conditions TA-Luft: Air temperature 32 °F, Atmospheric pressure absolute: 14,7 psi

	Date	Signature	No. of Assembly Drawing
Created	24.07.2014	Mz	
Released	24.07.2014	Kn	

Technical Data

Rating Data*			**60 Hz**	
λ = 1.0			METRIC	
Load	%	100	75	50
Ignition timing	grad	22	22	22
ISO standard rating	kW	300	225	150
Coolant heat	kW	239	213	183
Exhaust heat up to 120 °C	kW	187	141	98
Radiation heat max.	kW	12	9	8
Energy input	kW	776	618	462
Fuel Consumption	MJ/kWh	9,30	9,89	11,08
Efficiency*				
mechanical	%	38,7	36,4	32,5
thermal	%	54,9	57,3	60,8
total	%	93,6	93,7	93,3
Mass flows				
Combustion air	kg/h	952	759	567
Fuel	kg/h	56	45	33
Exhaust gas mass flow rate, wet	kg/h	1008	804	600
Exhaust gas mass flow rate, dry**	Nm³/h	817	651	486
Coolant mass flow rate	kg/h	39048		
Temperatures				
Exhaust gas temperature max.	°C	639		
Emissions				
NO_X	ppm	< 3400		
CO	ppm	< 5000		
HCHO	ppm	< 5		
NMHC	ppm	< 100		
HC	ppm	< 1800		
Engine surface noise	dB (A)	109	Total acoustic power	
Exhaust sound power level	dB (A)	125,0	Total acoustic power	
Reference surface	dB (A)	12,1	(exhaust)	

Reference gas mixing unit: Motortech VariFuel2 and ignition system MIC 4

* The technical data are based on natural gas with a calorific value of 10 kWh/Nm³ and a methane no. > 80

The efficiency data are calculated by means of the ISO standard power acc to DIN ISO 3046-1

Standard conditions: Atmospheric pressure absolute: 100 kPa

Air temperature 25 °C

Relative air humidity 30 %

The measured efficiency data are: 37,2 %, 35,1 %, 31,3 % (mechanical at 100, 75 and 50 % load) at following conditions:

Installation location height: 310 m above sea level, atmospheric pressure absolute: 97,0 kPa, inlet air temperature: 25 °C, relative air humidity: 31 %

Rating adaptation at ambient conditions acc to DIN ISO 3046-1

The tolerance for the usable heat is ±7 % at rated output

The coolant data are based on a 45 % portion of antifreeze

** Standard conditions TA-Luft: Temperature 0°C, Pressure absolute: 100 kPa

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Technical Data

Rating Data*			**60 Hz**	
λ = 1.0			ENGLISH	
Load	%	100	75	50
Ignition timing	°BTDC	22	22	22
ISO standard rating	Btu/min	17061	12795	8530
Coolant heat	Btu/min	13592	12113	10407
Exhaust heat up to 120 °C	Btu/min	10634	8019	5573
Radiation heat max.	Btu/min	682	512	455
Energy input	Btu/min	44130	35145	26273
Fuel Consumption	Btu/bhp-hr	529	562	630
Efficiency*				
mechanical	%	38,7	36,4	32,5
thermal	%	54,9	57,3	60,8
total	%	93,6	93,7	93,3
Mass flows				
Combustion air	lb/hr	2099	1673	1250
Fuel	lb/hr	123	98	73
Exhaust gas mass flow rate, wet	lb/hr	2222	1771	1323
Exhaust gas mass flow rate, dry*	Nm³/h	817	651	486
Coolant mass flow rate	lb/hr	86087		
Temperatures				
Exhaust gas temperature max.	°F	1182		
Emissions				
NO_X	ppm	< 3400		
CO	ppm	< 5000		
HCHO	ppm	< 5		
NMHC	ppm	< 100		
HC	ppm	< 1800		
Engine surface noise	dB (A)	109	Total acoustic power	
Exhaust sound power level	dB (A)	125,0	Total acoustic power	
Reference surface	dB (A)	12,1	(exhaust)	

Reference gas mixing unit: Motortech VariFuel2 and ignition system MIC 4

* The technical data are based on natural gas with a calorific value of 10 kWh/Nm³ and a methane no. > 80

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Air temperature 77 °F
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The measured efficiency data are: 37,2 %, 35,1 %, 31,3, % (mechanical at 100, 75 and 50 % load) at following conditions:

Installation location height: 1017 ft above sea level, atmospheric pressure absolute: 14,0 psi, inlet air temperature: 77 °F, relative air humidity: 31 %

Rating adaptation at ambient conditions acc to DIN ISO 3046-1

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The coolant data are based on a 45 % portion of antifreeze

** Standard conditions TA-Luft: Air temperature 32 °F, Atmospheric pressure absolute: 14,7 psi

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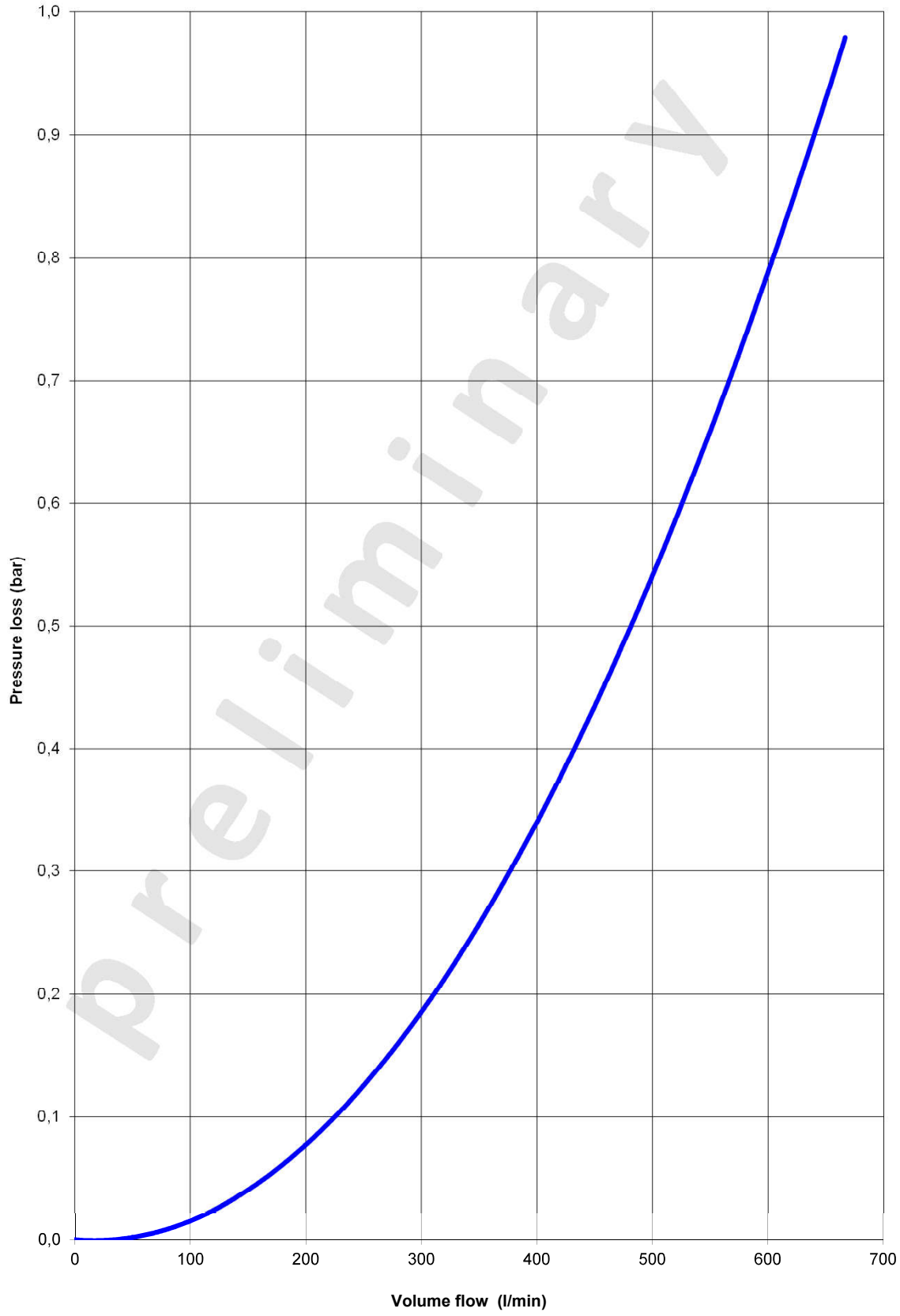
Resistance Curve of Engine



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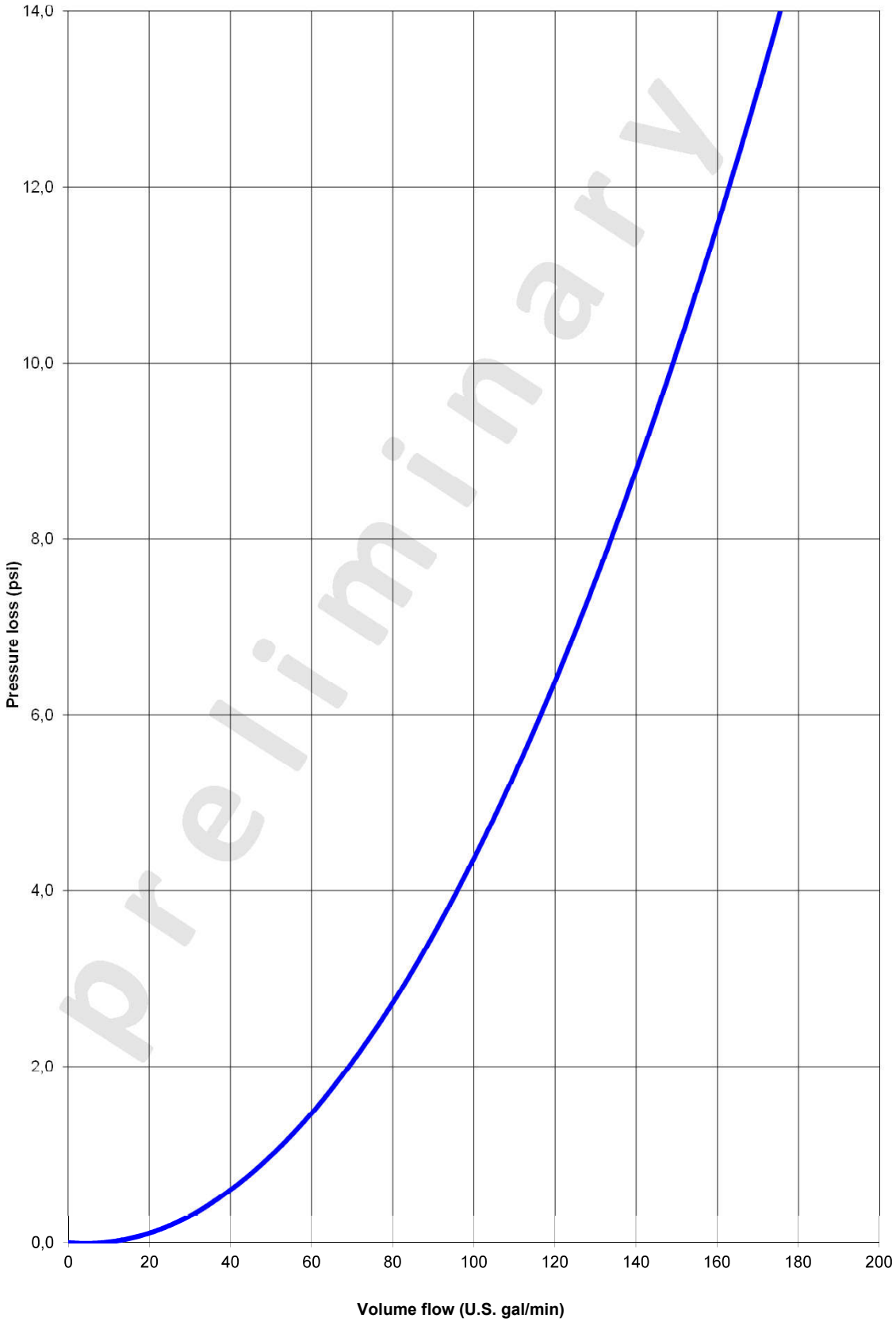
Resistance Curve of Engine



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