



**High efficiency  
permanent magnet-synchronous-  
submersible motors 10"**

**po-mo-s10.1**

## High efficiency permanent magnet-synchronous-submersible motors 10"

### Design

The **oddesse** permanent magnet-synchronous-submersible motor is a rewindable motor designed as a wet-running motor with a watertight insulated winding. The motor connection is according to international standards, the pump shaft is connected to the motor using a sleeve coupling. The bearings are lubricated by the motor filling. It is a mixture of glycerine and water. Glycerine is biodegradable and secures the frost protection up to -25 °C. If necessary, it can be replaced by pure drinking water.

Axial down thrusts are absorbed by the axial thrust bearing with individual tilting pads. Motors are encapsulated by a high quality mechanical seal. The pressure compensation between motor and its environment is granted by a reliable balance system. The motors are completed with water pressure-tight cables. They are earthed inside. The motors comply with the VDE-directives and the EC safety requirements for machinery.

Motors are usable in horizontal and diagonal position depending on the nominal power. **oddesse** motors work in both rotating directions. A high efficiency guarantees lowest operating costs.

- |                        |   |
|------------------------|---|
| • Motor connection     | 10" key   |
| • Degree of protection | IP68 (EN60034-5)  |
| • Cable length         | 10 m, other lengths on request  |
| • Cable version        | single core round cable, suitable for drinking water, other versions on request |
| • Temperature control  | PTC / PT100 optional  |
| • Materials            | AISI 316 / AISI 904L  |

For all motors a wide range of control and monitoring systems is available.

### Applications

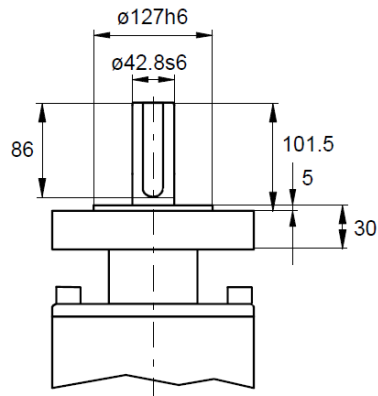
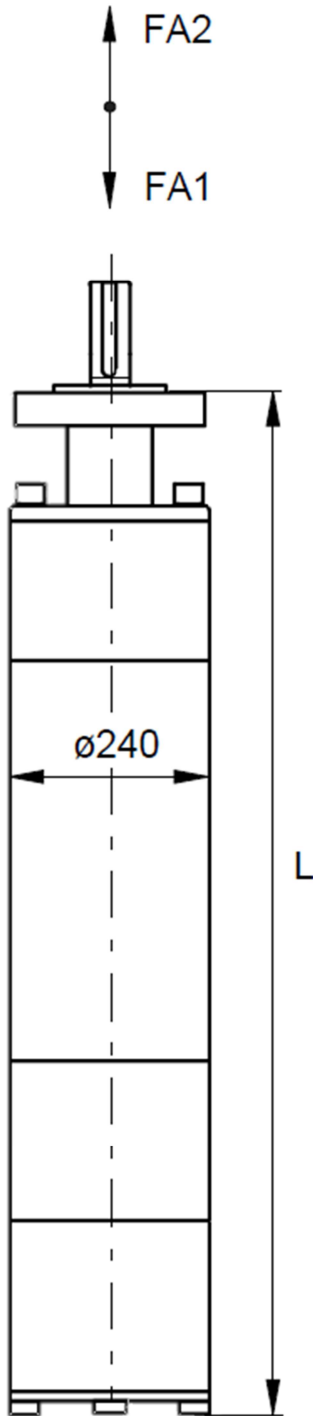
The **oddesse** submersible motors of the series po-mo-s are designed as drive unit for submersible pumps. They are also applicable for other submersible machines and for offshore operation.

### Operating data

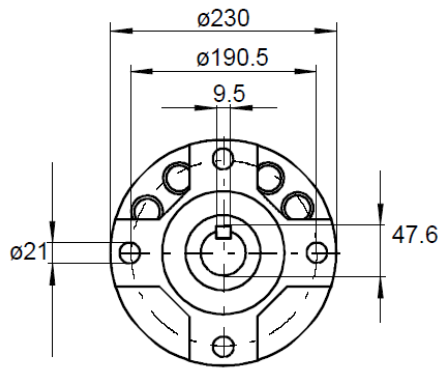
For the operation of the motor it is necessary to use a suitable frequency converter programmed with special software. Additionally it is advisable to use a sine-wave filter or dU/dt-filter. The max. useable frequency of 120 Hz should be considered in the system design.

Additional parameters are:

- |  |  |
|--|--|
| • Acceleration time to minimum frequency | ≤ 3 s  |
| • Stopping time to zero frequency        | ≤ 3 s  |
| • Switching frequency                    | max. 10/h, switching pause ≥ 1 min   |
| • Use                                    | horizontal / vertical  |
| • Nominal speed                          | horizontal 1800 ... 3600 1/min (60 ... 120 Hz)<br>vertical 1500 ... 3600 1/min (50 ... 120 Hz) |
| • Ambient temperature                    | max. 50 °C   |
| • Cooling flow                           | 0.5 - 1.0 m/s (see table)  |
| • Tolerances                             | DIN VDE 0530 / IEC 34  |
| • Voltage tolerances                     | ±10 % System (power)-supply  |
| • Frequency tolerances                   | -5 ... +10 % System (power)-supply   |
| • Max. rate of the increase in voltage   | dU/dt ≤ 500 V/μs   |
| • Max. voltage peaks to ground           | ≤ 1000 V   |



Pump connection acc. to **NEMA**-standards



Main dimensions [mm]

**po-mo-s10.1 • Grid 500 V • 50/60 Hz • 3 ~**

Type	Power P		Length L		Weight m	
	kW	HP	mm	inch	kg	lbs
M/DOP940P1x	150 - 250	200 - 340	1973	77,7	438	964
M/DOP1090P1x	200 - 375	340 - 470	2123	83,6	482	1063

x – Material design (see table below)

**FA1** Downthrust capacity: 60 kN / 13500 lbs  
**FA2** Upthrust capacity: 1.4 kN / 330 lbs

Components	Design	
	X (AISI 316)	Y (AISI 904L)
Shaft	Stainless steel / 1.4462	
Motor flange	Stainless steel / 1.4571	Stainless steel / 1.4539
Motor casing	Stainless steel / 1.4571	Stainless steel / 1.4539
Radial bearing	Steel / carbon	
Thrust bearing	Steel / carbon	
Screws, Nuts, Bolts	Stainless steel / 1.4401	Stainless steel / 1.4539
Mechanical seal	SiC / SiC	

**po-mo-s10.1 • Netz 500 V • 50/60 Hz • 3 ~**

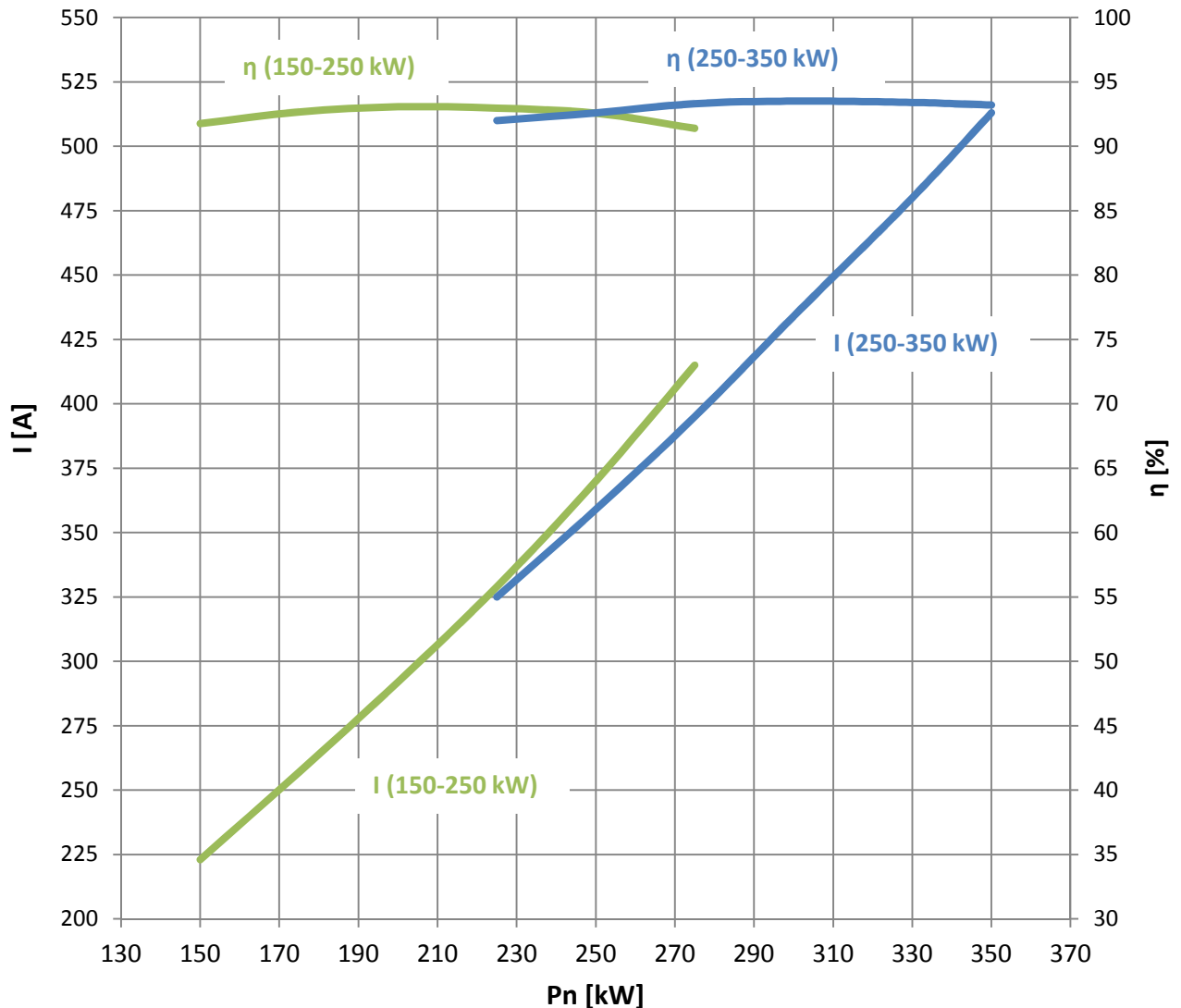
Type	Pn		In	$\eta$	cos $\varphi$	n	Round cable **		vmin [m/s]	
	kW	HP					A	%	1/min	mm <sup>2</sup>
M/DOP940P1x	150	200	223	91,8	0,99	3000	3x	rd1x95/50	0,5	1,0
	175	235	257	92,7	0,99	3000	3x	rd1x95/50	0,5	1,0
	200	270	292	93,1	0,99	3000	3x	rd1x95/50	0,5	1,0
	225	300	329	93,0	0,99	3000	3x	rd1x95/50	0,5	1,0
	250	335	370	92,6	0,99	3000	3x	rd1x95/50	0,5	1,0
M/DOP1090P1x	250	335	395	92,6	0,99	3000	3x	rd1x120/70	0,5	1,0
	275	370	434	93,3	0,99	3000	3x	rd1x120/70	0,5	1,0
	300	400	480	93,5	0,99	3000	3x	rd1x120/70	0,5	1,0
	325	435	513	93,4	0,99	3000	3x	rd1x120/70	0,5	1,0
	350	470	553	93,2	0,99	3000	3x	rd1x120/70	0,5	1,0

$I_a/I_n^* = 1, M_n/M_a^* = 1$ ; Performance data were determined with oddesse system components.

\* referred to the inverter inputs (mains side) and therefore to the overall system.

\*\* other cable versions on request.

Pn	Rated output	In	Rated current	$I_a/I_n$	Starting-/rated current
$\eta$	Efficiency	cos $\varphi$	Power factor	$M_a/M_n$	Starting-/rated torque
n	Rated speed	vmin	min. cooling flow	T	Ambient temperature



**System components**

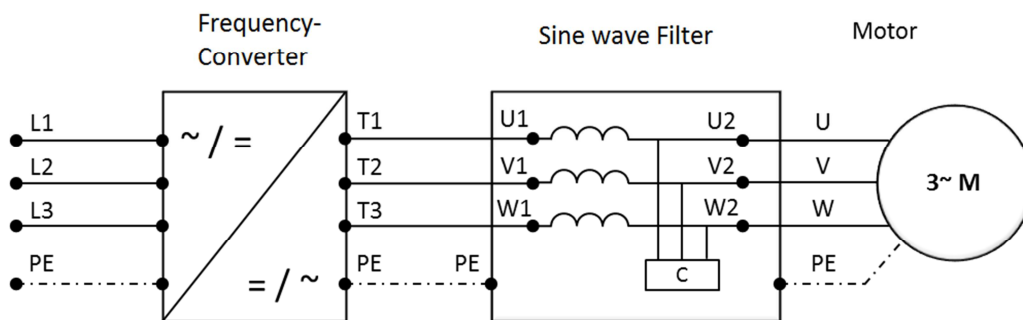
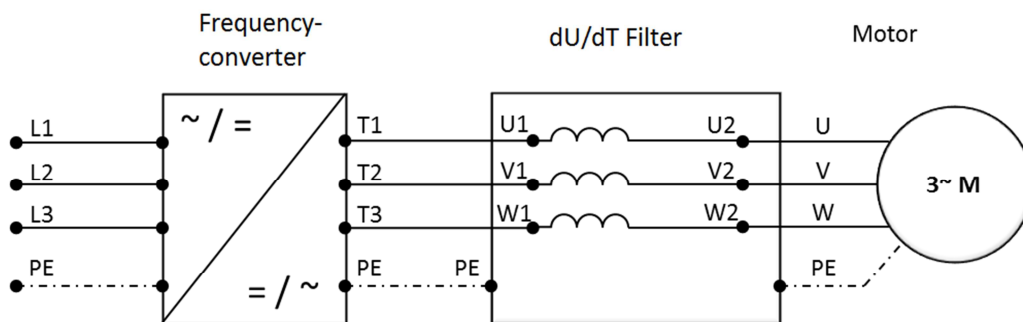
po-mo-s10.1 • Grid 500 V • 50/60 Hz • 3 ~

Type	Pn		Frequency converter		dU/dt - Filter		Sine-wave Filter	
	kW	HP	REFU		REDU		REFS	
			IP00	IP54	IP00	IP54	IP00	IP54
M/DOP940P1x	150	200	00 261	a. A.	00 350	a. A.	00 410	a. A.
	175	235	00 310	a. A.	00 420	a. A.	00 410	a. A.
	200	270	00 310	a. A.	00 420	a. A.	00 410	a. A.
	225	300	00 385	a. A.	00 600	a. A.	00 600	a. A.
	250	335	00 385	a. A.	00 600	a. A.	00 600	a. A.
M/DOP1090P1x	250	335	00 460	a. A.	00 600	a. A.	00 600	a. A.
	275	370	00 460	a. A.	00 820	a. A.	00 840	a. A.
	300	400	00 520	a. A.	00 820	a. A.	00 840	a. A.
	325	435	00 590	a. A.	00 820	a. A.	00 840	a. A.
	350	470	00 590	a. A.	00 820	a. A.	00 840	a. A.

The dimensioning of the system components is related to the rated data of the motor at a rated frequency of 100 Hz. For higher frequencies please consult with the oddesse service.

IP54-version on request!

**Electrical connection**



**Frequency converter**



**Design**

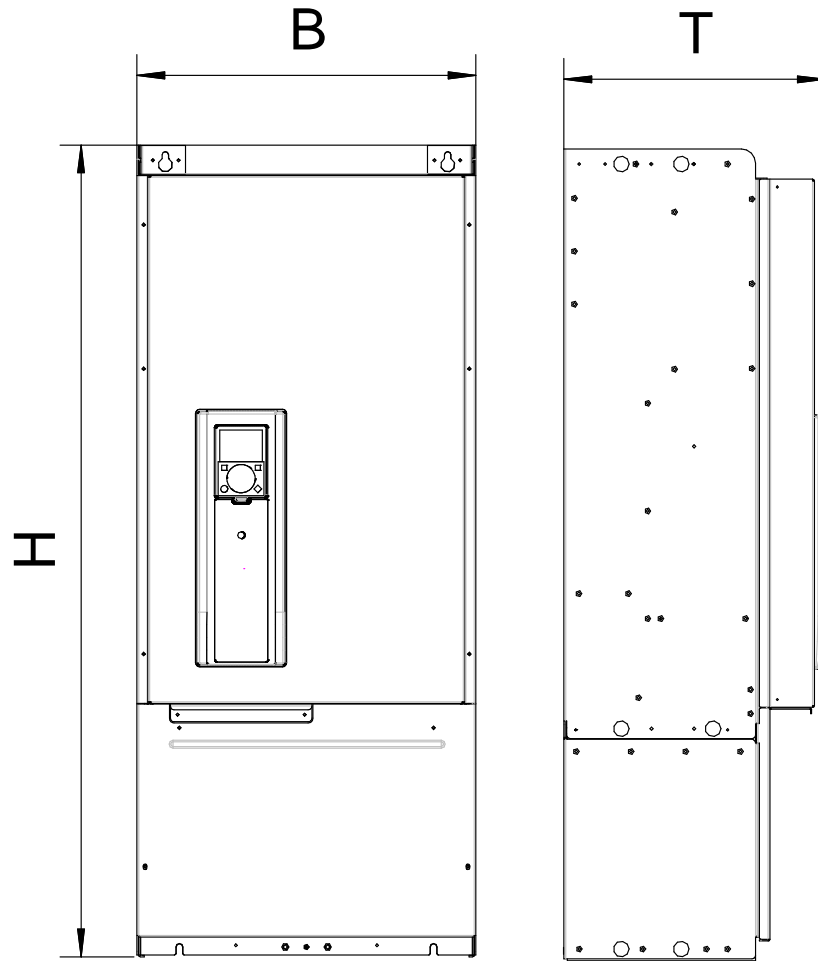
The fully equipped frequency converter is dedicated to improve flow control and to save energy for use in water and waste water applications.

It is designed for wall or switch cabinet installation. An EMC filter and an integrated DC reactor are included.

Main connection	Input voltage $U_{in}$	380 - 500 V; optional up to 690 V; $\pm 10\%$ Tolerance
	Input frequency $f_{in}$	50-60 Hz, -5...+10 %
	Main connection	max. once per minute
Motor connection	Output voltage	0 - $U_{in}$
	Continuous output current	$I_n$ : Ambient temperature max. +40 °C Overload 1,5 x $I_n$ (1 min/10 min)
	Output frequency	0 – 320 Hz (standard)
	Frequency resolution	0,01 Hz
Control characteristics	Switching frequency	1,5 – 6 kHz
	Acceleration time	0,1 – 3000 s
	Stopping time	0,1 – 3000 s
Environment characteristics	Temperature	-10 °C ... +40 °C at 100% $I_n$ > 40 °C Power reduction 1,5 % je 1 °C
	Storage temperature	-40 °C ... +70 °C
	Installation altitude	at 100 % $I_n$ up to 1000 m; max. 4000 m > 1000 m Power reduction 1,0 % per 100m
Control Interfaces	I/O	2 x Analog input
		1 x Analog output
		6 x Digital input
		1 x 24V Input
		2 x 24V Output
		2 x Relay output
		1 x Thermistor input (PTC)
	Ethernet	Modbus TCP/IP
	RS485	Modbus RTU
Real time clock	including backup battery	
EMC	Immunity	IEC 61800-3, first and second environment
	Emissions	IEC 61800-3, class C2

For further details please contact oddesse.

**Dimensions**



Type	In	Dimension			Weight m [kg]	
		A	B [mm]	H [mm]		T [mm]
REFU00...	261	261	480	840	365	104
	310	310	480	840	365	104
	385	385	508	980	525	205
	460	460	508	980	525	205
	520	520	508	980	525	205
	590	590	508	980	525	205

**Options**

- Additional card 3 x input for temperature sensors (PT100, ...)
- Additional card 3 x Relay outputs
- Additional card Profibus DPV1
- Marine version
- Door installation kit for control panel (2-15m cable)
- PC-interface cable (USB-RS485)

**dU/dt-Filter**



**Design**

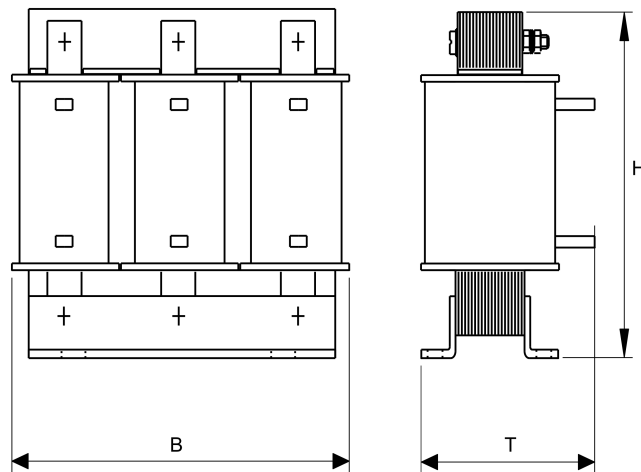
By using a dU/dt Filter the slew rate on the motor terminals is reduced in a simple way to values  $< 500 \text{ V}/\mu\text{s}$ . It protects the motor insulation against breakdown (especially old and weak motor insulation). This is particularly important for short motor cables.

The motor losses and the heating of the motor are minimized and the leakage current is reduced, which increases the lifetime of submersible motors.

**Electrical data**

- Voltage 3 x 500 V
- Frequency 100 Hz
- Max. cable length 90-150 m (depending on power range)
- Overload  $1,6 \times I_n$  (1 min); every 10min
- Clock frequency 3,6 kHz
- Operating temperature 40 °C; without power reduction
- Operating altitude 1000 m, without power reduction

**Dimensions**



Type	In	Dimension				Weight m [kg]
		A	B [mm]	H [mm]	T [mm]	
REDU00...	350	256	300	297	224	39
	420	307	300	347	255	46
	600	438	300	391	259	57
	820	599	300	500	257	71



**Sine-wave filter**



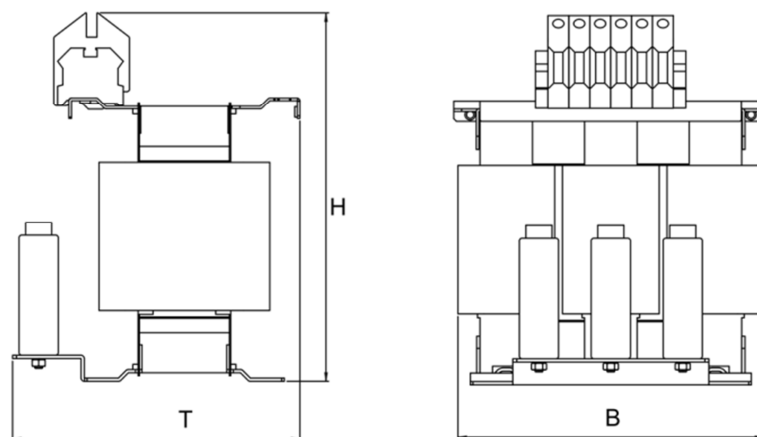
**Design**

Sine-wave filters can be connected between inverter output and submersible motor. The pulse-width modulated (PWM) inverter output voltage is converted into a sinus voltage. Especially with long motor cables sinusoidal filters should be used to reduce parasitic capacities of the motor cable. It helps to reduce noise levels. Not only emissions on the motor cables are significantly attenuated, but also the voltage peaks, which are caused by the inverter switching frequency. The purpose of a sine-wave filter is to prevent damage to the motors` winding insulation. By using a sine-wave filter additional losses and motor noises are reduced. The use of shielded cables may be dispensed with in certain cases.

**Electrical data**

- Voltage 3 x 500 V
- Frequency 100 Hz
- Max. cable length 500 m (depending on power range)
- Overload 1,6 x In (1 min); every 10 min
- Clock frequency ≥ 3,6 kHz
- Operating temperature 40 °C; without power reduction
- Operating altitude 1000 m, without power reduction

**Dimensions**



Type	In	Dimension			Weight	
		A	B [mm]	H [mm]		T [mm]
REFS00...	410	299	455	462	477	166
	600	438	480	523	488	202
	840	613	480	651	487	239

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