# SECTION THREE

## REFERENCES

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## INGREDIENT TABLES



You can get the latest ingredient information, including recipes and where to buy them, from my website:

http://www.modernistcookingmadeeasy.com/info/modernist-ingredients

References: Ingredient Tables 228

## INGREDIENT TECHNIQUES

Ingredient	Emulsions	Foams	Gels	Spherification	Thickening
Agar		х	X		
Carrageenan: Iota		х	X	Х	Х
Carrageenan: Lambda	Х	х			Х
Carrageenan: Kappa			X		
Gelatin		х	X		
Gellan	Х	х	X		
Guar Gum	Х				Х
Gum Arabic	х	х			Х
Konjac	Х		X		Х
Lecithin	х	х			
Locust Bean Gum			X		Х
Maltodextrin					Х
Methylcellulose	х	х	X		
Mono and Diglycerides	х	х			Х
Pectin	х	х	X		
Pure Cote B790			X		
Sodium Alginate			X	Х	
Ultra-Sperse	Х	Х			Х
Ultra-Tex	X	x			X
Versawhip		х			
Xanthan Gum	Х	х			Х

### INGREDIENT TEMPERATURES

When you are trying to determine which ingredient to use, the hydration, setting, and melting temperatures can be very important.

Ingredient	Dispersion	Hydration	Gel Sets	Gel Melts
Agar	Any	100°C / 212°F	40-45°C / 104-113°F	80°C / 175°F
Carrageenan: Iota	Cool	Above 70°C / 158°F	40-70°C / 104-158°F	5-10°C / 9-18°F above setting
Carrageenan: Kappa	Cool	Above 70°C / 158°F	35-60°C / 95-140°F	10-20°C / 18-36°F above setting
Gelatin	Above 50°C / 122°F	Cool	30°C / 86°F	30°C / 86°F - 40°C / 104°F
Lecithin	Any	Any	N/A	N/A
Maltodextrin	Room temperature	N/A	N/A	N/A
Methylcellulose				
Methocel F50	Any	Below 15°C / 59°F	Above 62-68°C / 143-154°F	Below 30°C / 86°F
Methocel A4C	Hot	Below 15°C / 59°F	Above 50-55°C / 122-131°F	Below 25°C / 77°F
Mono and Diglycerides	Above 60°C / 140°F	Any	N/A	N/A
Sodium Alginate	Any	Any	Any	Above 130°C / 266°F
Xanthan Gum	Any	Any	N/A	N/A

# Sous Vide Time and Temperature



If you are looking for more sous vide information I have many articles covering the process and equipment used, as well as over 50 recipes.

http://www.modernistcookingmadeeasy.com/info/modernist-techniques/ more/sous-vide-cooking-technique One of the most interesting aspects of sous vide cooking is how much the time and temperature used can change the texture of the food. Many people experiment with different cooking times and temperatures to tweak dishes various ways.

The numbers below are merely beginning recommendations and are a good place to start. Feel free to increase or lower the temperature several degrees or play around with the cooking time as you see fit as long as you stay in the safe-zone.

### DONENESS RANGE

One of the most common questions we get asked about our sous vide recipes is some variation of "the recipe says to cook it for 3 to 6 hours, but when is it actually done".

The short answer is that anytime within the given range the food is "done". As long as the food has been in the water bath for more than the minimum time and less than the maximum time, then it is done. There isn't a specific magical moment of true doneness that can be generalized. For more information, here's the explanation why.

#### The How and Why

To have this conversation we first need to determine what "done" actually means. For sous vide there are two main "doneness" concerns when cooking your food. The first is to ensure that the food actually comes up to the temperature you are cooking it at (or becomes pasteurized at for some food). The second concern is making sure the food is

tender enough to eat without being "over tender", mushy, or dry.

Once the food you are cooking is completely up to temperature and it is tenderized enough to eat (and not over tenderized), it is now "done". For some already tender cuts of meat like filets, loins, and chicken breasts you don't have to worry about tenderness since they start out that way. That means that these cuts are "done" once they get up to temperature. You can find out this time using our Sous Vide Thickness Ruler.

However, despite them being "done" at the minimum time shown, they stay "done" for several hours past that time, depending on the starting tenderness of the meat. This is why we give a range. You can eat a 1" cut of filet mignon after 50 minutes but you can also eat the filet up to 3 hours after it has gone into the bath without any loss in quality, tenderness, or flavor.

This is how our ranges are determined. They specify that for an average cut of the given meat, they will become "great to eat" tender at the minimum time given. They will continue to get more tender the longer they are in the bath but will remain "great to eat" tender until the final time given, at which point they may begin to get mushy and overcooked. In essence, they will be "done", and very tasty, for that entire span between the minimum and maximum times.

#### Another Way to Look at It

Another way to think about how this works is to use the following analogy. Pretend you were helping a new cook grill a steak. If they told you they wanted to cook it medium rare and asked you how to tell when it was "done", what would you say?

Most people would reply with "when the temperature is between 131°F to 139°F". If the friend isn't a cook they would ask "Yeah, but when is it actually done?"

The answer at this point really comes down to personal preference since to some people medium rare is perfect at 131°F and others prefer a little more well-done 135°F, but a medium rare steak is "done" anywhere in that range.

#### **Other Critical Variables**

One other complicating factor is that there are many variables that go into determining how fast a piece of meat tenderizes and/or becomes tender.

The most obvious variable is that some cuts of meat are tougher. For example, a top round roast needs to be tenderized a lot longer than a ribeye. Most people realize this and that's why almost all sous vide charts break the food down by "cut".

Another less obvious but almost as important factor is where the meat came from. There is a big difference between how fast the meat tenderizes and how the cow was raised. I've found that grass-fed meat from my local farmer needs just 1/2 the time to become tender compared to supermarket meat (this is also true when roasting or braising them). I've also talked

to a reader in Mexico who eats local grassfed beef that needs slightly longer times than normal because the cows work more.

There are then the variables in the actual cow itself. Whether the meat is prime or choice makes a difference in tenderizing time. As does the marbling, how old the meat is, and several other factors.

So taking all of this together it can be hard to accurately determine a range of "doneness" that will work for all cuts of meat. But we try our best to come up with a wide range of times that the "average" piece of meat will be done in. The only way to really learn is to experiment with the types of meat in your area and see how they react. And luckily for us, sous vide allows us to have a wide range that food is done in.

#### **In Conclusion**

So while there might be one magical moment in the cooking process where a certain piece of meat is the most ideal tenderness, in practice there is a wide time range in the cooking process where the meat will be "done". As long as you take it out sometime in that range it should turn out great.

As you get more experience with your local meats, and determine your personal preferences, you can start to tweak your cook times to suit them more exactly. But as you are learning just remember that the food will be "done" anywhere in that range, and don't sweat the details!

## BEEF - ROASTS AND TOUGH CUTS

#### **Bottom Round Roast**

Medium Rare131°F for 2 to 3 Days (55.0°C)Medium140°F for 2 to 3 Days (60.0°C)Well-Traditional160°F for 1 to 2 Days (71.1°C)

#### Brisket

Medium Rare131°F for 2 to 3 Days (55.0°C)Medium140°F for 2 to 3 Days (60.0°C)Well-Traditional160°F for 1 to 2 Days (71.1°C)

#### Cheek

Medium Rare131°F for 2 to 3 Days (55.0°C)Medium149°F for 2 to 3 Days (65.0°C)Well-Traditional160°F for 1 to 2 Days (71.1°C)

#### Chuck Roast

Medium Rare131°F for 2 to 3 Days (55.0°C)Medium140°F for 2 to 3 Days (60.0°C)Well-Traditional160°F for 1 to 2 Days (71.1°C)

#### Pot Roast

Medium Rare131°F for 2 to 3 Days (55.0°C)Medium140°F for 2 to 3 Days (60.0°C)Well-Traditional160°F for 1 to 2 Days (71.1°C)

#### Prime Rib Roast

Medium Rare131°F for 5 to 10 Hours (55°C)Medium140°F for 5 to 10 Hours (60°C)

#### **Rib Eye Roast**

Medium Rare131°F for 5 to 10 Hours (55°C)Medium140°F for 5 to 10 Hours (60°C)

Ribs

Medium Rare131°F for 2 to 3 Days (55.0°C)Medium140°F for 2 to 3 Days (60.0°C)Well-Traditional160°F for 1 to 2 Days (71.1°C)

#### Shank

Medium Rare	131°F for 2 to 3 Days (55.0°C)
Medium	140°F for 2 to 3 Days (60.0°C)
Well-Traditional	160°F for 1 to 2 Days (71.1°C)

#### Short Ribs

Medium Rare	131°F for 2 to 3 Days (55.0°C)
Medium	140°F for 2 to 3 Days (60.0°C)
Well-Traditional	$160^{\circ}$ F for 1 to 2 Days (71.1°C)

#### Sirloin Roast

Medium Rare	131°F for 5 to 10 Hours (55.0°C)
Medium	140°F for 5 to 10 Hours (60.0°C)

#### Stew Meat

Medium Rare131°F for 4 to 8 Hours (55.0°C)Medium140°F for 4 to 8 Hours (60.0°C)

#### Sweetbreads

Medium	140°F for 30 to 45 Min (60°C)
Pre-Roasting	152°F for 60 Min (66.7°C)

#### **Tenderloin Roast**

Medium Rare	131°F for 3 to 6 Hours (55.0°C)
Medium	140°F for 3 to 6 Hours (60.0°C)

#### Tongue

Low and Slow	140°F for 48 Hours (60.0°C)
High and Fast	158°F for 24 Hours (70.0°C)

#### **Top Loin Strip Roast**

Medium Rare131°F for 4 to 8 Hours (55.0°C)Medium140°F for 4 to 8 Hours (60.0°C)

#### **Top Round Roast**

Medium Rare	131°F for 1 to 3 Days (55.0°C)
Medium	140°F for 1 to 3 Days (60.0°C)
Well-Traditional	160°F for 1 to 2 Days (71.1°C)

#### **Tri-Tip Roast**

Medium Rare	131°F for 5 to 10 Hours (55°C)
Medium	$140^{\circ}$ F for 5 to 10 Hours (60°C)

## **BEEF - STEAK AND TENDER** CUTS

#### **Blade Steak**

Medium Rare 131°F for 4 to 10 Hours (55.0°C) Medium 140°F for 4 to 10 Hours (60.0°C)

#### **Bottom Round Steak**

Medium Rare 131°F for 1 to 3 Days (55.0°C) Medium 140°F for 1 to 3 Days (60.0°C)

#### **Chuck Steak**

Medium Rare 131°F for 1 to 2 Days (55.0°C) Medium 140°F for 1 to 2 Days (60.0°C)

#### **Eye Round Steak**

Medium Rare 131°F for 1 to 2 Days (55.0°C) Medium 140°F for 1 to 2 Days (60.0°C)

#### Flank Steak

Medium Rare 131°F for 2 to 12 Hours (55.0°C) Medium Rare 131°F for 1 to 2 Days (55.0°C) and Tender Medium 140°F for 2 to 12 Hours (60.0°C) Medium and 140°F for 1 to 2 Days (60.0°C) Tender

#### Flat Iron Steak

Medium Rare 131°F for 4 to 10 Hours (55.0°C) Medium 140°F for 4 to 10 Hours (60.0°C)

#### Hamburger

Medium Rare 131°F for 2 to 4 Hours (55.0°C) Medium 140°F for 2 to 4 Hours (60.0°C)

#### Hanger Steak

Medium Rare 131°F for 2 to 3 Hours (55.0°C) Medium 140°F for 2 to 3 Hours (60.0°C)

#### Porterhouse Steak

Medium Rare 131°F for 2 to 3 Hours (55.0°C) Medium 140°F for 2 to 3 Hours (60.0°C)

#### **Rib Steak**

Medium Rare 131°F for 2 to 8 Hours (55.0°C) Medium 140°F for 2 to 8 Hours (60.0°C)

#### **Ribeye Steak**

Medium Rare	131°F for 2 to 8 Hours (55.0°C)
Medium	140°F for 2 to 8 Hours (60.0°C)

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#### Sausage

Medium Rare	131°F for 2 to 3 Hours (55.0°C)
Medium	140°F for 90 to 120 Min (60°C)

#### Shoulder Steak

Medium Rare 131°F for 4 to 10 Hours (55.0°C) Medium 140°F for 4 to 10 Hours (60.0°C)

#### Sirloin Steak

Medium Rare 131°F for 2 to 10 Hours (55.0°C) Medium 140°F for 2 to 10 Hours (60.0°C)

#### Skirt Steak

Medium Rare 131°F for 1 to 2 Days (55.0°C) Medium 140°F for 1 to 2 Days (60.0°C)

#### **T-Bone Steak**

Medium Rare 131°F for 2 to 3 Hours (55.0°C) Medium 140°F for 2 to 3 Hours (60.0°C)

#### Tenderloin Steak

Medium Rare	131°F for 2 to 3 Hours (55.0°C)
Medium	140°F for 2 to 3 Hours (60.0°C)

#### **Top Loin Strip Steak**

Medium Rare 131°F for 2 to 3 Hours (55.0°C) 140°F for 2 to 3 Hours (60.0°C) Medium

#### **Top Round Steak**

Medium Rare 131°F for 1 to 2 Days (55.0°C) Medium 140°F for 1 to 2 Days (60.0°C)

#### **Tri-Tip Steak**

Medium Rare	131°F for 2 to 10 Hours (55.0°C)
Medium	140°F for 2 to 10 Hours (60.0°C)

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### CHICKEN AND EGGS

#### Breast

Rare	136°F for 1 to 4 Hours (57.8°C)
Medium / Typical	140°F - 147°F for 1 to 4 Hours (63.9°C)
More Dry	140°F - 147°F for 4 to 12 Hours (63.9°C)

#### Drumstick

Rare	140°F for 90 to 120 Min (60.0°C)
Ideal	148°F - 156°F for 2 to 5 Hours (64.4°C)
For Shredding	$160^{\rm o}\text{F}$ - $170^{\rm o}\text{F}$ for 8 to 12 Hours (71.1°C)

#### Eggs

142°F - 146°F for 45 to 60 Min (62.8°C)
142°F for 45 to 60 Min (61.1°C)
148°F for 45 to 60 Min (64.4°C)
149°F - 152°F for 45 to 60 Min (65.6°C)
135°F for 75 Min (57.2°C)

#### Leg

Rare	140°F for 90 to 120 Min (60.0°C)
Ideal	148°F - 156°F for 2 to 5 Hours (64.4°C)
For Shredding	160°F - 170°F for 8 to 12 Hours (71.1°C)

#### Sausage

White Meat140°F for 1 to 2 Hours (63.9°C)Mixed Meat140°F for 90 to 120 Min (60.0°C)

#### Thigh

Rare	140°F for 90 to 120 Min (60.0°C)
Ideal	148°F - 156°F for 2 to 5 Hours (64.4°C)
For Shredding	160°F - 170°F for 8 to 12 Hours (71.1°C)

#### Whole Chicken

Rare	140°F for 4 to 6 Hours (60.0°C)
Typical	148°F for 4 to 6 Hours (64.4°C)
Larger	148°F for 6 to 8 Hours (64.4°C)
Butterflied	148°F for 2 to 4 Hours (64.4°C)

## DUCK

#### Breast

Medium Rare	131°F for 2 to 4 Hours (55.0°C)
Medium	140°F for 2 to 4 Hours (60.0°C)

#### Drumstick

Medium Rare	131°F for 3 to 6 Hours (55.0°C)
Well	176°F for 8 to 10 Hours (80.0°C)
Confit	167°F for 10 to 20 Hours (75.0°C)

#### Foie Gras

Foie Gras 134°F for 35 to 55 Min (56.7°C)

#### Leg

Medium Rare	131°F for 3 to 6 Hours (55.0°C)
Well	176°F for 8 to 10 Hours (80.0°C)
Duck Confit	167°F for 10 to 20 Hours (75.0°C)

#### Sausage

Breast Meat	131°F for 1 to 2 Hours (55.0°C)
Mixed Meat	131°F for 2 to 3 Hours (55.0°C)

#### Thigh

Medium Rare	131°F for 3 to 6 Hours (55.0°C)
Well	176°F for 8 to 10 Hours (80.0°C)
Confit	167°F for 10 to 20 Hours (75.0°C)

#### Whole Duck

Medium Rare	131°F for 3 to 6 Hours (55.0°C)
Medium	140°F for 3 to 6 Hours (60.0°C)
Confit	167°F for 10 to 20 Hours (75.0°C)

### FISH AND SHELLFISH

#### Arctic Char

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Bass

 "Sushi", Rare
 104°F for 10 to 30 Min (40.0°C)

 "Sushi", Medium
 122°F for 10 to 30 Min (50.0°C)

 Rare
 132°F for 10 to 30 Min (55.6°C)

 Medium Rare
 132°F for 10 to 30 Min (60.0°C)

 Medium
 140°F for 10 to 30 Min (60.0°C)

#### **Black Sea Bass**

 "Sushi", Rare
 104°F for 10 to 30 Min (40.0°C)

 "Sushi", Medium
 122°F for 10 to 30 Min (50.0°C)

 Rare
 132°F for 10 to 30 Min (55.6°C)

 Medium Rare
 132°F for 10 to 30 Min (60.0°C)

 Medium
 140°F for 10 to 30 Min (60.0°C)

#### Bluefish

"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Carp

"Sushi", Medium 122°F for 10 to 30 Min (50.0°C) Rare Medium Rare 132°F for 10 to 30 Min (55.6°C) Medium 140°F for 10 to 30 Min (60.0°C)

#### Catfish

 "Sushi", Medium
 122°F for 10 to 30 Min (50.0°C)
 Rare

 Medium Rare
 132°F for 10 to 30 Min (55.6°C)

 Medium
 140°F for 10 to 30 Min (60.0°C)

#### Cod

 Rare
 104°F for 10 to 30 Min (40.0°C)

 "Sushi", Medium
 129°F for 10 to 30 Min (53.9°C)

 Rare
 132°F for 10 to 30 Min (55.6°C)

#### Flounder

"Sushi", Medium Rare	122°F for 10 to 30 Min (50.0°C)
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	$140^{\circ}$ F for 10 to 30 Min (60.0°C)
Wiculum	140 1 101 10 10 00 Will (00.0 C)
Grouper	
"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)
Unddoal	
	122°E for 10 to 20 Min (E0.0%)
Baro	122 F 10F 10 to 30 Will (30.0 C)
Natium Para	$120^{\circ}$ E for 10 to 20 Min (55 6°C)
Medium Kare	132 F 10F 10 to 30 Min (33.8 C)
Medium	140 F for 10 to 30 Min (60.0 C)
Hake	
"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)
TT 111 .	
Halibut	
"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	129°F for 10 to 30 Min (53.9°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)
King Crab Tail	
King Crab Tail	140°F for 30 to 45 Min (60.0°C)
0	
Lobster	
Medium Rare	126°F for 15 to 40 Min (52.2°C)
Medium	140°F for 15 to 40 Min (60.0°C)
Mackarol	
"Sushi" Raro	109°F for 10 to 30 Min (42.8°C)
"Sushi" Modium	$120^{\circ}$ E for 10 to 30 Min (50.0°C)
Raro	122 1 101 10 to 50 Will (50.0 C)
Medium Rare	132°F for 10 to 30 Min (55.6°C)
THE MIMINI MULL	102 I IOI IO 10 00 IVIII (00.0 C)

#### Mahi Mahi

TO ANTIC TO ANTIC	
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Marlin

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Monkfish

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	118°F for 10 to 30 Min (47.8°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min ( $60.0^{\circ}$ C)

#### Octopus

Slow Cook	$170^{\rm o}F$ for 4 to 7 Hours (76.7°C)
Fast Cook	$180^{\rm o}F$ for 2 to 3 Hours (82.2°C)

#### **Red Snapper**

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Salmon

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Sardines

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min ( $60.0^{\circ}$ C)

#### Scallops

Pre-Sear 122°F for 15 to 35 Min (50.0°C)

#### Scrod

"Sushi", Medium Rare	122°F for 10 to 30 Min (50.0°C)
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)
Sea Bass	
"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium Rare	122°F for 10 to 30 Min (50.0°C)
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)
Shark	
"Sushi", Medium Rare	122°F for 10 to 30 Min (50.0°C)
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)
Shrimp	
"Sushi" Medium	122°F for 15 to 35 Min (50.0°C)
Kare	1220E ( 1E +- 2E M: (EE (9C))
Medium Kare	132°F for 15 to 35 Min (55.6°C)
Skate "Suchi" Modium	$120^{\circ}E$ for 10 to 20 Min (52.0°C)
Rare	129 F for 10 to 50 Min (55.9 C)
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)
Soft Shell Crab	
Standard	145°F for 3 hours (62.8°C)
Sole	
"Sushi", Medium Baro	122°F for 10 to 30 Min (50.0°C)
Modium Paro	132°E for 10 to 30 Min (55.6°C)
Modium	$143^{\circ}$ E for 10 to 30 Min (61.7°C)
Medium	145 1 101 10 to 50 Will (01.7 C)
Squid	
Pre-Sear	113°F for 45 to 60 Min (45.0°C)
Low Heat	138°F for 2 to 4 Hours (58.9°C)
High Heat	180°F for 1 Hour (82.2°C)

#### Striped Bass

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Sturgeon

104°F for 10 to 30 Min (40.0°C)
122°F for 10 to 30 Min (50.0°C)
132°F for 10 to 30 Min (55.6°C)
140°F for 10 to 30 Min (60.0°C)

#### Swordfish

"Sushi", Rare	104°F for 10 to 30 Min (40.0°C)
"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

#### Tilapia

104°F for 10 to 30 Min (40.0°C)
122°F for 10 to 30 Min (50.0°C)
132°F for 10 to 30 Min (55.6°C)
140°F for 10 to 30 Min (60.0°C)

#### Trout

"Sushi", Medium	122°F for 10 to 30 Min (50.0°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min ( $60.0^{\circ}$ C)

#### Tuna

Turbot	
Kare Medium Rare	132°F for 10 to 30 Min (55.6°C)
"Sushi", Medium	129°F for 10 to 30 Min (53.9°C)
"Sushi", Rare	100°F for 10 to 20 Min (37.8°C)

"Sushi", Medium	129°F for 10 to 30 Min (53.9°C)
Rare	
Medium Rare	132°F for 10 to 30 Min (55.6°C)
Medium	140°F for 10 to 30 Min (60.0°C)

### FRUITS AND VEGETABLES

Acorn Squash	183°F for 1 to 2 Hours (83.9°C)	Pears	183°F for 25 to 35 Min (83.9°C)
Apples	183°F for 25 to 40 Min (83.9°C)	Pineapple	167°F for 45 to 60 Min (75.0°C)
Artichokes	183°F for 45 to 75 Min (83.9°C)	Plums	167°F for 15 to 20 Min (75.0°C)
Asparagus	183°F for 30 to 40 Min (83.9°C)	Potatoes	
Banana	183°F for 10 to 15 Min (83.9°C)	Small Large	183°F for 30 to 60 Min (83.9°C) 183°F for 60 to 120 Min (83.9°C)
Beet	183°F for 30 to 60 Min (83.9°C)	Pumpkin	183°F for 45 to 60 Min (83 9°C)
Broccoli	183°F for 20 to 30 Min (83.9°C)	Radish	183°F for 10 to 25 Min (83 9°C)
<b>Brussels Sprouts</b>	183°F for 45 to 60 Min (83.9°C)	Rhubarb	141°F for 25 to 45 Min (60.6°C)
Butternut Squash	183°F for 1 to 2 Hours (83.9°C)	Rutabaga	183°F for 2 Hours (83.9°C)
Cabbage	183°F for 30 to 45 Min (83.9°C)	Salsify	$183^{\circ}$ E for 45 to 60 Min (83 9°C)
Carrot	183°F for 40 to 60 Min (83.9°C)	Sausch Summer	183°E for 30 to 60 Min (83.9°C)
Cauliflower		Squash, Summer	100 F for 1 to 0 U U U U U U U U U U U U U U U U U U
Florets	183°F for 20 to 30 Min (83.9°C)	Squash, winter	165 F for 1 to 2 Hours (65.9 C)
For Puree Stems	$183^{\circ}$ F for 2 Hours (83.9°C) $183^{\circ}$ F for 60 to 75 Min (83.9°C)	Sunchokes	183°F for 40 to 60 Min (83.9°C)
Colory Poot	$182^{\circ}E$ for 60 to 75 Min (82.0°C)	Sweet Potatoes	
	183 F 101 00 to 75 Will (83.9 C)	Small Large	183°F for 45 to 60 Min (83.9°C) 183°F for 60 to 90 Min (83.9°C)
Chard	183°F for 60 to 75 Min (83.9°C)	Swiss Chard	183°E for 60 to 75 Min (83.0°C)
Cherries	183°F for 15 to 25 Min (83.9°C)	Swiss Chard	105 1º 101 00 to 75 Will (05.9 C)
Corn	183°F for 30 to 45 Min (83.9°C)	Turnip	183°F for 30 to 45 Min (83.9°C)
Eggplant	183°F for 30 to 45 Min (83.9°C)	Yams	183°F for 30 to 60 Min (83.9°C)
Fennel	183°F for 40 to 60 Min (83.9°C)	Zucchini	183°F for 30 to 60 Min (83.9°C)
Golden Beets	183°F for 30 to 60 Min (83.9°C)		
Green Beans	183°F for 30 to 45 Min (83.9°C)		
Leek	183°F for 30 to 60 Min (83.9°C)		
Onion	183°F for 35 to 45 Min (83.9°C)		
Parsnip	183°F for 30 to 60 Min (83.9°C)		
Pea Pods	183°F for 30 to 40 Min (83.9°C)		
Peaches	183°F for 30 to 60 Min (83.9°C)		

### LAMB

Medium Rare 131°F for 18 to 36 Hours (55.0°C) Medium 140°F for 18 to 36 Hours (60.0°C)

#### **Blade Chop**

Medium Rare Medium

Breast

Medium Rare 131°F for 20 to 28 Hours (55.0°C) Medium 140°F for 20 to 28 Hours (60.0°C) Well-Traditional 165°F for 20 to 28 Hours (73.9°C)

#### Leg, Bone In

Rare Medium Rare Medium

126°F for 1 to 2 Days (52.2°C) 131°F for 2 to 3 Days (55.0°C) 140°F for 1 to 3 Days (60.0°C)

126°F for 1 to 2 Hours (52.2°C)

131°F for 2 to 4 Hours (55.0°C)

140°F for 2 to 3 Hours (60.0°C)

131°F for 18 to 36 Hours (55.0°C)

140°F for 18 to 36 Hours (60.0°C)

#### Leg, Boneless

Medium Rare 131°F for 18 to 36 Hours (55.0°C) Medium 140°F for 18 to 36 Hours (60.0°C)

#### Loin Chops

Rare Medium Rare Medium

Loin Roast

Rare 126°F for 1 to 2 Hours (52.2°C) Medium Rare 131°F for 2 to 4 Hours (55.0°C) Medium 140°F for 2 to 3 Hours (60.0°C)

#### Loin, Boneless

126°F for 1 to 2 Hours (52.2°C) Rare Medium Rare 131°F for 2 to 4 Hours (55.0°C) Medium 140°F for 2 to 3 Hours (60.0°C)

#### Neck

Medium Rare	131°F for 2 to 3 Days (55.0°C)
Medium	140°F for 2 to 3 Days (60.0°C)
Well-Traditional	165°F for 1 to 2 Days (73.9°C)

#### Osso Buco

Medium Rare 131°F for 1 to 2 Days (55.0°C) Medium 140°F for 1 to 2 Days (60.0°C) Well-Traditional 165°F for 1 to 2 Days (73.9°C)

#### Rack

Rare 126°F for 1 to 2 Hours (52.2°C) Medium Rare 131°F for 2 to 3 Hours (55.0°C) Medium 140°F for 1 to 3 Hours (60.0°C)

#### **Rib Chop**

Rare Medium Rare Medium

126°F for 1 to 2 Hours (52.2°C) 131°F for 2 to 3 Hours (55.0°C) 140°F for 1 to 3 Hours (60.0°C)

#### Ribs

Medium Rare 131°F for 22 to 26 Hours (55.0°C) Medium 140°F for 22 to 26 Hours (60.0°C) Well-Traditional 165°F for 22 to 26 Hours (73.9°C)

#### Shank

Medium Rare	131°F for 1 to 2 Days (55.0°C)
Medium	140°F for 1 to 2 Days (60.0°C)
Well-Traditional	165°F for 1 to 2 Days (73.9°C)

#### Shoulder

Medium Rare	131°F for 1 to 2 Days (55.0°C)
Medium	140°F for 1 to 2 Days (60.0°C)
Well-Traditional	165°F for 18 to 36 Hours (73.9°C)

#### Tenderloin

Rare	126°F for 1 to 2 Hours (52.2°C)
Medium Rare	131°F for 2 to 3 Hours (55.0°C)
Medium	140°F for 1 to 3 Hours (60.0°C)

### Pork

#### Arm Steak

Medium Rare	131°F for 1 to 2 Days (55.0°C)
Medium	140°F for 1 to 2 Days (60.0°C)

#### **Baby Back Ribs**

Medium Rare131°F for 8 to 10 Hours (55.0°C)Medium140°F for 8 to 10 Hours (60.0°C)Well-Traditional 155°F for 12 to 24 Hours (68.3°C)

#### **Back Ribs**

Medium Rare131°F for 8 to 12 Hours (55.0°C)Medium140°F for 8 to 12 Hours (60.0°C)Well-Traditional 155°F for 12 to 24 Hours (68.3°C)

#### Belly

Low and Slow140°F for 2 to 3 Days (60.0°C)In Between160°F for 18 to 36 Hours (71.1°C)High and Fast180°F for 12 to 18 Hours (82.2°C)

#### **Blade Chops**

Medium Rare131°F for 8 to 12 Hours (55.0°C)Medium140°F for 8 to 12 Hours (60.0°C)

#### **Blade Roast**

Medium Rare131°F for 1 to 2 Days (55.0°C)Medium140°F for 1 to 2 Days (60.0°C)Well-Traditional 155°F for 1 to 2 Days (68.3°C)

#### **Blade Steak**

 Medium Rare
 131°F for 18 to 36 Hours (55.0°C)

 Medium
 140°F for 18 to 36 Hours (60.0°C)

#### **Boston Butt**

Medium Rare	131°F for 1 to 2 Days (55.0°C)
Medium	140°F for 1 to 2 Days ( $60.0^{\circ}$ C)
Well-Traditiona	155°F for 1 to 2 Days (68.3°C)

#### **Butt Roast**

#### **Country Style Ribs**

Medium Rare131°F for 8 to 12 Hours (55.0°C)Medium140°F for 8 to 12 Hours (60.0°C)Well-Traditional 155°F for 12 to 24 Hours (68.3°C)

#### Fresh Side Pork

Low and Slow	140°F for 2 to 3 Days (60.0°C)
In Between	160°F for 18 to 36 Hours (71.1°C)
High and Fast	180°F for 12 to 18 Hours (82.2°C)

#### **Ground Pork**

Medium Rare131°F for 2 to 4 Hours (55.0°C)Medium140°F for 2 to 4 Hours (60.0°C)

#### Ham Roast

Medium Rare $131^{\circ}F$  for 10 to 20 Hours (55.0°C)Medium $140^{\circ}F$  for 10 to 20 Hours (60.0°C)Well-Traditional 155°F for 10 to 20 Hours (68.3°C)

#### Ham Steak

Medium Rare131°F for 2 to 3 Hours (55.0°C)Medium140°F for 2 to 3 Hours (60.0°C)

#### Kebabs

Medium Rare $131^{\circ}F$  for 3 to 8 Hours (55.0°C)Medium $140^{\circ}F$  for 3 to 8 Hours (60.0°C)Well-Traditional 155°F for 3 to 8 Hours (68.3°C)

#### Leg (Fresh Ham)

Medium Rare $131^{\circ}F$  for 10 to 20 Hours (55.0°C)Medium $140^{\circ}F$  for 10 to 20 Hours (60.0°C)Well-Traditional 155°F for 10 to 20 Hours (68.3°C)

#### Loin Chop

Medium Rare131°F for 3 to 5 Hours (55.0°C)Medium140°F for 2 to 4 Hours (60.0°C)

#### Loin Roast

Medium Rare131°F for 4 to 8 Hours (55.0°C)Medium140°F for 4 to 6 Hours (60.0°C)

#### **Picnic Roast**

Medium Rare $131^{\circ}F$  for 1 to 3 Days (55.0°C)Medium $140^{\circ}F$  for 1 to 3 Days (60.0°C)Well-Traditional 155°F for 1 to 3 Days (68.3°C)

#### **Pork Chops**

Medium Rare	131°F for 3 to 6 Hours (55.0°C)
Medium	140°F for 2 to 4 Hours (60.0°C)

#### **Rib Chops**

Medium Rare	131°F for 5 to 8 Hours (55.0°C)
Medium	140°F for 4 to 7 Hours (60.0°C)

#### **Rib Roast**

Medium Rare	131°F for 5 to 8 Hours (55.0°C)
Medium	140°F for 4 to 7 Hours (60.0°C)

#### Sausage

Medium Rare	131°F for 2 to 3 Hours (55.0°C)
Medium	140°F for 2 to 3 Hours (60.0°C)
Well-Traditiona	l155°F for 2 to 3 Hours (68.3°C)

#### Shank

Medium Rare	131°F for 8 to 10 Hours (55.0°C)
Medium	140°F for 8 to 10 Hours (60.0°C)

#### Shoulder

Medium Rare	135°F for 1 to 2 Days (57.2°C	])
Medium	145°F for 1 to 2 Days (62.8°C	])
Well-Traditional	155°F for 1 to 2 Days (68.3°C	])

#### **Sirloin Chops**

Medium Rare	131°F for 6 to 12 Hours (55.0°C)
Medium	140°F for 5 to 10 Hours (60.0°C)

#### Sirloin Roast

#### **Spare Ribs**

Medium Rare	131°F for 12 to 24 Hours (55.0°C)
Medium	140°F for 12 to 24 Hours (60.0°C)
Well-Traditional	155°F for 12 to 24 Hours (68.3°C)

#### Spleen

Spleen 145°F for 1 Hour (62.8°C)

#### Tenderloin

Medium Rare	131°F for 3 to 6 Hours (55.0°C)
Medium	140°F for 2 to 4 Hours (60.0°C)

### TURKEY

#### Breast

"Rare"	136°F for 1 to 4 Hours (57.8°C)
Medium / Typical	140°F - 147°F for 1 to 4 Hours (63.9°C)

#### Drumstick

Medium Rare	140°F for 3 to 4 Hours (60.0°C)
Ideal	148°F for 4 to 8 Hours (64.4°C)
For Shredding	160°F for 18 to 24 Hours (71.1°C)

#### Leg

Medium Rare	140°F for 3 to 4 Hours (60.0°C)
Ideal	148°F for 4 to 8 Hours (64.4°C)
For Shredding	160°F for 18 to 24 Hours (71.1°C)

#### Sausage

White Meat	140°F for 1 to 4 Hours (63.9°C)
Mixed Meat	140°F for 3 to 4 Hours (64.4°C)

#### Thigh

Medium Rare	140°F for 3 to 4 Hours (60.0°C)
Ideal	148°F for 4 to 8 Hours (64.4°C)
For Shredding	160°F for 18 to 24 Hours (71.1°C)

### FAHRENHEIT TO CELSIUS CONVERSION

This guide gives temperatures in both Fahrenheit and Celsius but to convert from Fahrenheit to Celsius take the temperature, then subtract 32 from it and multiply the result by 5/9:

(Fahrenheit - 32) \* 5/9 = Celsius

We've listed out the temperatures from 37°C to 87°C which are the most commonly used range in sous vide.

Celsius	Fahrenheit
37	98.6
38	100.4
39	102.2
40	104.0
41	105.8
42	107.6
43	109.4
44	111.2
45	113.0
46	114.8
47	116.6
48	118.4
49	120.2
50	122.0
51	123.8
52	125.6
53	127.4
54	129.2
55	131.0
56	132.8
57	134.6
58	136.4
59	138.2
60	140.0
61	141.8
62	143.6
63	145.4

Celsius	Fahrenheit
64	147.2
65	149.0
66	150.8
67	152.6
68	154.4
69	156.2
70	158.0
71	159.8
72	161.6
73	163.4
74	165.2
75	167.0
76	168.8
77	170.6
78	172.4
79	174.2
80	176.0
81	177.8
82	179.6
83	181.4
84	183.2
85	185.0
86	186.8
87	188.6
88	190.4
89	192.2
90	194.0

## SOUS VIDE THICKNESS TIMES



There are two ways to cook sous vide, one is based on the thickness of the food and the other is based on the desired tenderness.

Cooking based on thickness is how PolyScience, Baldwin, and Nathan started out as they did research on food safety. Cooking sous vide based on thickness basically tells you the minimum time you can cook a piece of meat to ensure it is safe and comes up to temperature in the middle. It doesn't take into account tenderizing time or any other factors. It's often used by restaurants or home cooks who want to minimize cooking time and are using tender cuts of meat that don't need the tenderization.

Cooking sous vide based on tenderness takes into account how tough a piece of meat is and how long it needs to be cooked in order to make it appealing. So a chuck steak needs to be cooked a lot longer than a filet, even though they are both safe after the same amount of time. As long as the minimum cooking time is met for the temperature used, then it's completely safe to eat.

Both sous vide methods have their uses. Thickness-based is great for very tender cuts cooked by people who need them done in the minimum amount of time. Tendernessbased is best for tougher cuts or people that have a range of time that they are interested in.

#### A Few Notes on the Times

Times were extrapolated from the descriptions in Baldwin's Practical Guide to Sous Vide (http://bit.ly/hGOtjd) and Sous Vide for the Home Cook, as well as Nathan's tables on eGullet and a few other sources. (http://bit.ly/eVHjS3).

The times are also approximate since there are many factors that go into how quickly food is heated. The density of the food matters a lot, which is one reason beef heats differently than chicken. To a lesser degree where you get your beef from will affect the cooking time, and whether the beef was factory raised, farm raised, or grass-fed. Because of this, I normally don't try to pull it out at the exact minute it is done unless I'm in a rush.

The times shown are also minimum times and food can be, and sometimes needs to be, left in for longer periods in order to fully tenderize the meat. If you are cooking food longer, remember that food should not be cooked at temperatures less than 131°F (55°C) for more than 4 hours.

## Heat from Refrigerator to Any Temperature

How long it will take to heat an entire piece of meat from  $41^{\circ}$ F /  $5^{\circ}$ C to the temperature of the water bath.

Reminder, this food might not be pasteurized at these times and food should not be cooked at temperatures less than 131°F / 55°C for more than 4 hours.

While there are slight differences in the heating time for different temperatures of water baths, the times usually vary less than 5 to 10% even going from a  $111^{\circ}F / 44^{\circ}C$  bath to a  $141^{\circ}F / 60.5^{\circ}C$  bath, which equates to a difference of 5 minutes every hour. We show the largest value in our chart, so if you are cooking it at a lower temperature you can knock a little of the time off.

#### Heat from Freezer to Any Temperature

How long it will take to heat an entire piece of meat from 32°F / -18°C to the temperature of the water bath. Reminder, this food might not be pasteurized at these times and food should not be cooked at temperatures less than 131°F / 55°C for more than 4 hours.

While there are slight differences in the heating time for different temperatures of water baths, the times usually vary less than 5 to 10% even going from a  $111^{\circ}F / 44^{\circ}C$  bath to a  $141^{\circ}F / 60.5^{\circ}C$  bath, which equates to a difference of 5 minutes every hour. We show the largest value in our chart, so if you are cooking it at a lower temperature you can knock a little of the time off.

## Pasteurize from Refrigerator to 131°F / 55°C

This is the amount of time it will take a piece of meat that is  $41^{\circ}F / 5^{\circ}C$  to become pasteurized in a  $131^{\circ}F / 55^{\circ}C$  water bath.

## Pasteurize from Refrigerator to $141^{\circ}F / 60.5^{\circ}C$

This is the amount of time it will take a piece of meat that is 41°F / 5°C to become pasteurized in a 141°F / 60.5°C water bath.

#### Heat from Refrigerator to Any Temperature

70mm	6h 25m
65mm	5h 30m
60mm	4h 45m
55mm	4h 0m 0s
50mm	3h 15m
45mm	2h 40m
40mm	2h 10m
35mm	1h 40m
30mm	1h 15m 0s
25mm	0h 50m
20mm	0h 35m
15mm	0h 20m
10mm	0h 8m
5mm	0h 2m 0s

#### Heat from Freezer to Any Temperature

70mm	7 hrs 40 mins
65mm	6 hrs 40 mins
60mm	5 hrs 35 mins
55mm	4 hrs 45 mins
50mm	4 hrs 00 mins
45mm	3 hrs 10 mins
40mm	2 hrs 30 mins
35mm	2 hrs 00 mins
30mm	1 hrs 30 mins
25mm	1 hrs 00 mins
20mm	0 hrs 40 mins
15mm	0 hrs 25 mins
10mm	0 hrs 10 mins
5mm	0 hrs 02 mins

#### Pasteurize from Refrigerator to 131°F / 55°C

5 hrs 15 mins
4 hrs 45 mins
4 hrs 15 mins
3 hrs 50 mins
3 hrs 25 mins
3 hrs 00 mins
2 hrs 40 mins
2 hrs 20 mins
2hrs00mins
1 hrs 50 mins
1 hrs 40 mins
1 hrs 30 mins
1 hrs 25 mins
1 hrs 20 mins

#### Pasteurize from Refrigerator to $141^\circ F\,/\,60.5^\circ C$

70mm	3 hrs 50 mins
65mm	3 hrs 25 mins
60mm	3 hrs 00 mins
55mm	2 hrs 40 mins
50mm	2 hrs 20 mins
45mm	2 hrs 00 mins
40mm	1 hrs 40 mins
35mm	1 hrs 25 mins
30mm	1 hrs 10 mins
25mm	0 hrs 55 mins
20mm	0 hrs 45 mins
15mm	0 hrs 35 mins
10mm	0 hrs 25 mins
5mm	0 hrs 21 mins

## Pasteurize from Refrigerator to $135.5^{\circ}F / 57.5^{\circ}C$

This is the amount of time it will take a piece of chicken that is 41°F / 5°C to become pasteurized in a 135.5°F / 57.5°C water bath.

## Pasteurize from Refrigerator to $141^{\circ}F$ / $60.5^{\circ}C$

This is the amount of time it will take a piece of chicken that is  $41^{\circ}F / 5^{\circ}C$  to become pasteurized in a  $141^{\circ}F / 60.5^{\circ}C$  water bath.

## Pasteurize from Refrigerator to $146.3^{\circ}F / 63.5^{\circ}C$

This is the amount of time it will take a piece of chicken that is 41°F / 5°C to become pasteurized in a 146.3°F / 63.5°C water bath.

## Pasteurize from Refrigerator to $150.8^{\circ}F / 66^{\circ}C$

This is the amount of time it will take a piece of chicken that is  $41^{\circ}F / 5^{\circ}C$  to become pasteurized in a  $150.8^{\circ}F / 66^{\circ}C$  water bath.

#### Pasteurize from Refrigerator to 135.5°F / 57.5°C

70mm	6h 30m
65mm	6h
60mm	5h 15m
55mm	4h 45m
50mm	4h 15m
45mm	3h 45m
40mm	3h 20m
35mm	3h
30mm	2h 35m
25mm	2h 20m
20mm	2h 5m
15mm	1h 55m
10mm	1h 45m
5mm	1h 40m

#### Pasteurize from Refrigerator to 141°F / 60.5°C

70mm	4h 55m
65mm	4h 20m
60mm	3h 50m
55mm	3h 20m
50mm	2h 55m
45mm	2h 30m
40mm	2h 5m
35mm	1h 45m
30mm	1h 25m
25mm	1h 10m
20mm	0h 55m
15mm	0h 45m
10mm	0h 36m
5mm	0h 31m

#### Pasteurize from Refrigerator to 146.3°F / 63.5°C

70mm	4h 0m 0s
65mm	3h 35m
60mm	3h 10m
55mm	2h 45m
50mm	2h 20m
45mm	2h
40mm	1h 40m
35mm	1h 20m
30mm	1h
25mm	0h 50m
20mm	0h 35m
15mm	0h 23m
10mm	0h 15m
5mm	0h 10m

#### Pasteurize from Refrigerator to 150.8°F / 66°C

70mm 3h 35m 0s 65mm 3h 10m 60mm 2h 45m 55mm 2h 20m 50mm 2h 45mm 1h 40m 1h 25m 40mm 1h 5m 35mm 30mm 0h 50m 25mm 0h 40m 20mm 0h 26m 0h 20m 15mm 0h 10m 10mm 5mm 0h 5m

### FISH THICKNESS CHART

#### Heat Fatty Fish to Any Temperature

These times show how long it will take to heat an entire piece of fatty fish from  $41^{\circ}F$  /  $5^{\circ}C$  to any typical temperature.

Reminder, this food might not be pasteurized at these times and food should not be cooked at temperatures less than 131°F / 55°C for more than 4 hours.

While there are slight differences in the heating time for different temperatures of water baths, the times usually vary less than 5 to 10% even going from a 111°F / 44°C bath to a 141°F / 60.5°C bath, which equates to a difference of 5 minutes every hour. We show the largest value in our chart, so if you are cooking it at a lower temperature you can knock a little of the time off.

## Pasteurize Lean Fish to 131°F / 55°C

This is the amount of time it will take a piece of lean fish that is  $41^{\circ}F / 5^{\circ}C$  to

become pasteurized in a 131°F / 55°C water bath.

## Pasteurize Lean Fish to 141°F / 60.5°C

This is the amount of time it will take a piece of lean fish that is  $41^{\circ}F / 5^{\circ}C$  to become pasteurized in a  $141^{\circ}F / 60.5^{\circ}C$  water bath.

## Pasteurize Fatty Fish to $131^{\circ}F$ / $55^{\circ}C$

This is the amount of time it will take a piece of fatty fish that is  $41^{\circ}F / 5^{\circ}C$  to become pasteurized in a  $131^{\circ}F / 55^{\circ}C$  water bath.

## Pasteurize Fatty Fish to $141^{\circ}F$ / $60.5^{\circ}C$

This is the amount of time it will take a piece of fatty fish that is  $41^{\circ}F / 5^{\circ}C$  to become pasteurized in a  $141^{\circ}F / 60.5^{\circ}C$  water bath.

#### Heat Fatty Fish to Any Temperature

-
6 hrs 25 mins
5 hrs 30 mins
4 hrs 45 mins
4 hrs 00 mins
3 hrs 15 mins
2 hrs 40 mins
2 hrs 10 mins
1 hrs 40 mins
1 hrs 15 mins
0 hrs 50 mins
0 hrs 35 mins
0 hrs 20 mins
0 hrs 08 mins
0 hrs 02 mins

#### Pasteurize Lean Fish to 131°F / 55°C

70mm	5 hrs 15 mins
65mm	4 hrs 45 mins
60mm	4 hrs 15 mins
55mm	3 hrs 50 mins
50mm	3 hrs 25 mins
45mm	3 hrs 00 mins
40mm	2 hrs 40 mins
35mm	2 hrs 20 mins
30mm	2 hrs 00 mins
25mm	1 hrs 50 mins
20mm	1 hrs 40 mins
15mm	1 hrs 30 mins
10mm	1 hrs 25 mins
5mm	1 hrs 20 mins

#### Pasteurize Lean Fish to 141°F / 60.5°C

70mm 6 hrs 30 mins 6 hrs 00 mins 65mm 60mm 5 hrs 15 mins 4 hrs 45 mins 55mm 4 hrs 15 mins 50mm 45mm 3 hrs 45 mins 3 hrs 20 mins 40mm 35mm 3 hrs 00 mins 30mm 2 hrs 35 mins 2 hrs 20 mins 25mm 2 hrs 05 mins 20mm 15mm 1 hrs 55 mins 10mm 1 hrs 45 mins 1 hrs 40 mins 5mm

#### Pasteurize Fatty Fish to 131°F / 55°C

70mm	5 hrs 15 mins
65mm	4 hrs 45 mins
60mm	4 hrs 15 mins
55mm	3 hrs 50 mins
50mm	3 hrs 25 mins
45mm	3 hrs 00 mins
40mm	2 hrs 40 mins
35mm	2 hrs 20 mins
30mm	2 hrs 00 mins
25mm	1 hrs 50 mins
20mm	1 hrs 40 mins
15mm	1 hrs 30 mins
10mm	1 hrs 25 mins
5mm	1 hrs 20 mins

#### Pasteurize Fatty Fish to 141°F / 60.5°C

70mm	6 hrs 30 mins
65mm	6 hrs 00 mins
60mm	5 hrs 15 mins
55mm	4 hrs 45 mins
50mm	4 hrs 15 mins
45mm	3 hrs 45 mins
40mm	3 hrs 20 mins
35mm	3 hrs 00 mins
30mm	2 hrs 35 mins
25mm	2 hrs 20 mins
20mm	2 hrs 05 mins
15mm	1 hrs 55 mins
10mm	1 hrs 45 mins
5mm	1 hrs 40 mins

## ADDRESSING MODERNIST MISCONCEPTIONS



When you serve modernist foods to people, some of them are bound to bring up concerns. Here are some of the more common ones I've heard, and a few responses you can use. When they come up I try to address their concerns but I don't argue the points if they don't agree. There's no sense in getting in an argument, even over ignorant opinions. I'd rather just enjoy the party and they can miss out on the great food if they want to!

Remember, the best way to make everyone happy is always have a few "normal" dishes on hand that everyone can enjoy.

#### I Don't Like All These New Things

Many people feel that cooking should be done in the "traditional" way and don't like all of the new equipment and ingredients. I'm not really sure what they view as traditional, is it how their parents cooked? Maybe their grandparents?

Technically, anything we cook is a modernist dish because it is using techniques, equipment, and ingredients that weren't available in the past. Most anthropologists believe cooking started around 250,000 years ago when roasting, grilling, and braising came about. Even in the last 200 years alone, or the last 1% of time we've been cooking, we've seen the introduction of refrigeration, electricity, processed flour and sugar, not to mention the spreading of ingredients from around the world. So where exactly is the cutoff for "traditional" things? The first immersion blender was patented before non-stick pans were but it's considered "modernist" while people don't give non-stick pans a second thought.

Carrageenan has been used in Ireland for over a thousand years and agar has been used in Asia for several hundred years. By way of comparison, tomatoes have only been used by Europeans since the 1500s. So which of the three is really more modernist?

I think if you're willing to use electricity, non-stick pans, microwaves, and flour you should also embrace ingredients and techniques that have been in use almost as long, or even longer.

#### Are These Chemicals Safe?

One of the most common questions I get asked is some variation of "are these chemicals safe" or "why do you use these chemicals? I prefer natural foods".

I have to be honest, these are also questions that I asked myself before I started learning about modernist cooking. When I began looking for answers, what I found was pretty amazing. These new "chemicals" are really no different than many of the ingredients we currently use in cooking, and many of them have been around for a long, long time.

For instance, agar has been used in Asian cooking for hundreds of years and is just the extract from a certain type of algae. Xanthan gum is produced by fermenting sugar with a certain bacteria found in cabbage.

Most of the modernist ingredients are no more processed than kitchen stables you typically eat at home. Cornstarch (steeped, fermented, ground, washed, centrifuged, and dried corn) and sugar (diffused, clarified with lime, heated, evaporated, ionized, seeded, centrifuged, then dried sugarcane or beets) aren't exactly "natural", not to mention common ingredients like baking soda (sodium bicarbonate, a reaction of sodium chloride, ammonia, and carbon dioxide).

I'm not a scientist or a nutritionist, but it seems to me if you bake, thicken liquids with cornstarch, or eat anything with sugar in it, then you shouldn't have any issues with using the majority of the modernist ingredients. Many of these modernist ingredients are also used in normal store-bought foods such as sandwich bread, mayonnaise, ice cream, and salad dressings and have been for decades.

So unless you are on a "raw" or "paleo" diet, modernist ingredients are really no different than what you are already eating in your normal cooking.

#### Science or Cooking?

Another major criticism of modernist cooking is that it is "science" not "cooking", and that you need to understand chemistry and have lots of fancy equipment.

I think this viewpoint is mainly due to how recently many of these ingredients have started to be used in American kitchens. Because of this, there has been more experimentation and explanation about how they work. All of this discussion took place for our traditional ingredients centuries ago, but these exact same discussions did occur at one time.

For instance, you need to add water to the powdered mix and whisk until the thickening agent is evenly dispersed, becomes hydrated and a thick foam is formed, leavened by the carbon dioxide produced by the NaHCO<sub>3</sub> interacting with the hydrogen. The foam is then heated over medium-high heat until the cellular structure of the foam solidifies and sets, and non-enzymatic browning covers the surface.

Or, you could say "add water to the instant pancake mix, stir together, and cook until it isn't wet and the outside browns."

This same idea applies to modernist cooking. To utilize the thickening power of xanthan gum you don't need to understand how it works on a molecular level, just that adding some to a liquid will cause it to thicken.

I'm willing to bet that the majority of the people who say modernist cooking is too

complicated can make instant pancake mix just fine but couldn't begin to tell you how it works.

#### Do I Need Lab Equipment?

Similar to the last point, many people picture fancy, expensive equipment in a sterile lab. The truth is that the majority of modernist cooking can be done with standard kitchen tools you already have on hand.

In the Equipment section I give my recommendation for "required" modernist equipment and the total cost is under \$100. Sure, things like rotary evaporators and centrifuges cost thousands of dollars but they are equipment used for very specific purposes and most cooks would never need them.

### Why Do People Feel This Way?

There are many reasons that people have these misconceptions but I think the biggest one is very simple: clear, concise information for the average cook isn't easily available.

Always remember, people are entitled to their own opinions and it's not worth ruining your day trying to get them to see your side. Just feed them some macaroni and cheese and go enjoy your party!

## MODERNIST COOKING RESOURCES



For an up to date look at current books, websites, and other modernist cooking resources you can visit the list we keep on our website.

You can find it at: www.modernistcookingmadeeasy.com/info/ modernist-cooking-resources Modernist cooking is a very complex process and there is much more to learn about it in addition to what has been covered in this book. There is more and more good information available about modernist cooking. Here are some resources to help you continue to learn more.

### **MODERNIST RESOURCES**

### My Other Books

All of my books are available from Amazon.com or on my website.

Modernist Cooking Made Easy: Getting Started By Jason Logsdon My introductory book to modernist cooking including detailed looks at many of the most popular techniques and ingredients.

Modernist Cooking Made Easy: The Whipping Siphon By Jason Logsdon A detailed look at the whipping siphon. It covers the three main uses of the siphon: foaming, carbonating, and infusing.

Beginning Sous Vide: Low Temperature Recipes and Techniques for Getting Started at Home By Jason Logsdon

My main book covering sous vide. It deals a lot with the various equipment options and has over 100 recipes, some of which have been specially adapted for this book.

Sous Vide Grilling By Jason Logsdon This book is focused on grilling and BBQ recipes. It includes 95 great recipes covering steaks, burgers, kebabs, pulled pork, and everything in between.

Sous Vide: Help for the Busy Cook

By Jason Logsdon

My book focusing on how to use sous vide around your busy schedule. Full of recipes, tips and tricks to make sous vide work for you.

### **Recommended Books**

Modernist Cuisine: The Art and Science of Cooking By Nathan Myhrvold

This aims to be the bible of modernist cuisine. It's over 2,400 pages costs \$500 and was several years in the making. If you are serious about learning the newly developing modernist techniques then this might be worth the investment.

#### Modernist Cuisine at Home By Nathan Myhrvold

A much more accessible version of Modernist Cuisine especially written for the home cook.

#### Alinea

By Grant Achatz

A beautify, picture filled book with amazing techniques and whimsical dishes.

Ideas In Food By Aki Kamozawa and H. Alexander Talbot Delve into the "why" of traditional and modernist cooking.

*Texture -* A hydrocolloid recipe collection Compiled by Martin Lersch from Khymos.com, is a great compendium of recipes for many modernist ingredients.

On Food and Cooking By Harold McGee

This is the ultimate guide to the scientific aspects of cooking. If you like to know why things happen in the kitchen, at every level, you will find this book fascinating.

Cooking for Geeks By Jeff Potter

If you are interested in the geekier aspects of cooking then this book does a great job. It takes you through the basics of setting up your kitchen all the way up to kitchen hacks and sous vide cooking.

Under Pressure By Thomas Keller

This book shows you the extent of what is possible through sous vide cooking. The recipes aren't easy, and they require a lot of work but they can provide great inspiration for dishes of your own. If you are interested in expanding your concept of what can be accomplished through cooking then this is a must have.

### Websites

Modernist Cooking Made Easy http://www.modernistcookingmadeeasy.com/

Our website is full of recipes, tips, and tricks for modernist cooking. We also have forums and other ways to talk with other passionate chefs.

Hydrocolloids Primer http://www.cookingissues.com/primers/hydrocolloids-primer/

Dave Arnold and the Cooking Issues website help to clarify some of the uses of and reasons for modernist ingredients.

### Apps

I also have apps for the iPhone and iPad available, as well as one for the Android. You can search in the app store for "Molecular Gastronomy" and "Sous Vide" and mine should be near the top, published by "Primolicious".

### INGREDIENT AND TOOL SOURCES

Many of the modernist ingredients cannot be picked up at the local grocery store. We have had good luck on Amazon but here are some other good resources to find these ingredients.

Modernist Pantry

https://www.modernistpantry.com

Modernist Pantry has a good selection of ingredients and equipment. I tend to buy most of my ingredients through them.

Molecule-R

http://www.molecule-r.com/

Molecule-R has a good selection of packaged ingredients and tools. Their ingredients tend to be a little more expensive but if you are just getting started then their Cuisine R-Evolution kit can be a good way to get many of the ingredients and tools to get started.

PolyScience (Now Breville)

http://www.cuisinetechnology.com/

PolyScience carries many of the higher-end modernist cooking tools such as the antigriddle, chamber vacuum sealers, and rotary evaporators.

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# DID YOU ENJOY THIS BOOK?

If you enjoyed this book check out my other books on modernist cooking.



## Modernist Cooking Made Easy: Getting Started

If you are looking for more information about the other modernist techniques then my first book is for you. It will give you the information you need to create gels, foams, emulsions, as well as teach you how to do spherification, thickening, and sous vide cooking. It also has more than 80 easy-to-follow recipes to get you on your way.

## Modernist Cooking Made Easy: The Whipping Siphon

This book focuses on presenting the three main uses of the whipping siphon: Foaming, Infusing, and Carbonating. It delivers the information you need to understand how the techniques work and provides you with over 50 recipes to illustrate these techniques while allowing you to create great dishes using them.



### Both books are available from Amazon.com as a paperback and Kindle book, on iTunes, and on BN.com.

## ABOUT THE AUTHOR

Jason Logsdon is a passionate home cook, entrepreneur, and web developer. He helps cooks understand new modernist cooking techniques with easy-to-understand directions and recipes. He has a website and several books on modernist cooking that are read by thousands of people every month including *Modernist Cooking Made Easy: Getting Started, Modernist Cooking Made Easy: The Whipping Siphon, Beginning Sous Vide,* and *Sous Vide: Help for the Busy Cook.* His website is <u>www.ModernistCookingMadeEasy.com</u> and Jason can be reached at jason@modernistcookingmadeeasy.com or through Twitter at @jasonlogsdon\_sv.