



## Verapamil Hydrochloride Extended Release Tablets

Each extended release tablet contains **Verapamil HCl 240 mg**. This formulation features **Carbopol\* 971P NF polymer** as the extended release matrix ingredient. The formulation uses very low drug to polymer ratio of 8:1. The formulation meets the USP drug dissolution requirements (Test 3) for Verapamil Hydrochloride extended release tablets.

Number	Ingredients	% w/w	mg/Tablet
	Intra-Granular Phase:		
1.	Verapamil hydrochloride	39.22	240.0
2.	Carbopol* 971P NF polymer	4.90	30.0
3.	Microcrystalline cellulose (Avicel® PH-101)	53.92	330.0
	Extra-Granular Phase:		
4.	Magnesium stearate	0.82	5.0
5.	Talc	0.57	3.5
6.	Colloidal silicon dioxide	0.57	3.5
	TOTAL:	100.00	612.00

Lab batch size - 1000 tablets (water used as binder)

## **Process:**

- **1.** Weigh Verapamil hydrochloride, **Carbopol® 971P NF polymer** and microcrystalline cellulose and pass through a 40 mesh sieve. Add all the ingredients to a high shear granulator and mix for 10 minutes at 150 RPM impeller speed.
- **2.** Granulate the blend with water (about 120 ml water for 1000 tablet batch) in high shear granulator, adding the water as a thin stream, as droplets using peristaltic pump or as a spray and impeller speed above 250 to 300 RPM during wet massing.
- **3.** Dry the granules in fluid bed drier (inlet temperature at  $60^{\circ}$ C) to loss on drying (LOD) of about ~2%.
- **4.** Pass the dry granules through 18 mesh screen and blend them with magnesium stearate, talc and colloidal silicon dioxide (pre-screened through a 40-mesh sieve). Blend the dried granules with the lubricants in a V-blender for 2 minutes at 20 rpm.
- **5.** Compress the blended granules into tablets on a tablet press as follows:

• Punches: 17 x 8 mm biconcave capsule shaped

• Target weight: 612 mg

• Mechanical strength: 16 - 20 kP

• Friability: NMT 0.5 % w/w (100 revolutions)

Note: The tablets can be coated with a non-aqueous solution of hypromellose substitution type 2910 in isopropyl alcohol and methylene chloride to a weight gain of 6 mg/tablet.





## Verapamil Hydrochloride Extended Release Tablets

Final Tablet Properties:			
<b>Appearance:</b> Capsule shaped, biconvex tablets			
<b>Weight (mg)*:</b> 614 ± 10			
<b>Thickness (mm)*:</b> 5.56 ± 0.1			
Mechanical Strength (kP)*: 17.50			
Friability (100 revolutions) (%): 0.13			
<b>Dissolution:</b> Comply with the Test 3 of the USP monograph of Verapamil HCI ER Tablets			

Dissolution**(% average of 6 tablets)			
Time (h)	Lubrizol	USP Limits	
1	14.55	8 - 20	
2	24.32	15 - 35	
3.5	35.18	27 - 57	
5	51.00	45 - 75	
8	82.50	NLT 80	

<sup>\*\*</sup>USP Apparatus 2, 50 rpm, 1 hour in 900 ml 0.1N HCl followed by 7 hours in 900 ml pH 6.8 buffer with sinkers.

## **Summary:**

Carbopol® polymers have demonstrated to be useful and highly efficient as extended release matrix former making them a polymer of choice when formulating high drug load extended release tablets.

The Lubrizol Life Science Health website **www.lubrizol.com/Health** provides additional information:

- Bulletin 30 Controlled Release Tablets and Capsules; Bulletin 31 Formulating Controlled Release Tablets and Capsules with Carbopol; Bulletin 32 - Application of Carbopol 71G NF Polymer in Controlled Release Tablets
- Aqueous and non- aqueous granulation videos under video gallery
- Technical Papers, Technical Data Sheets, Test Procedures, Certificates, and other Formulations

Please contact your Lubrizol representative to get samples, quotations or further technical assistance.





9911 Brecksville Road Cleveland, OH 44141-3201 USA

Lubrizol.com/Health

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<sup>\*</sup>Average ± SD