Garlock
an EnPro Industries family of companies

Garlock GYLON® Products

Family of PTFE gasketing

Leaders in Sealing Integrity

GYLON®

Family of PTFE gasketing

GYLON® FAMILY HISTORY

When PTFE* was developed in 1938, the importance of the material to industrial sealing was quickly recognized because of the tremendous chemical resistance characteristics. While use of PTFE as a gasket material increased in industrial applications, complaints about certain properties started to build: skive marks made initial sealing difficult, cold flow caused leakage and premature failure, and temperature/pressure cycling was a problem.

RESISTANCE TO COLD FLOW (CREEP)

These drawbacks were eliminated when Garlock introduced Fawn GYLON®, Style 3500, in 1967. The GYLON® process minimizes creep and cold flow normally associated with PTFE products, while retaining other positive characteristics of PTFE. Fawn GYLON® was so innovative that it received *Chemical Processing* magazine's Vaaler Award in 1968. As the variety and quantity of industrial chemicals increased, Garlock realized that new products would be required to serve the growing market. Two additional GYLON® styles were introduced to meet those demands: Blue GYLON® Style 3504, and Off-White GYLON® Style 3510.

COMPRESSIBILITY

As the diversity of applications grew, so did the types of piping systems. A large number of exotic piping systems were required to handle the many hazardous and corrosive chemicals on the market. A common drawback of these types of piping materials is the small amount of gasket load available before the flange is distorted or cracked. In 1989, Garlock responded to this problem by introducing ENVELON®, another member of the GYLON® family. ENVELON® has a soft material on the gasket/flange interface where compressibility is important, but has a slightly harder core in the middle to prevent media permeation and blowout.

HIGH PRESSURE SERVICE, CHEMICAL COMPATIBILITY

As production demands increased, pipe hammering and/or pressure spikes became more common. GYLON® Series HP 3560 and HP 3561 were designed to meet those extreme conditions. These perforated stainless steel-inserted GYLON® gasket materials outperform any other gasketing available for high pressure service where chemical compatibility is a concern.

LOW BOLT LOAD SEALING

In 1994, Garlock introduced GYLON® Style 3545 for low bolt load applications. It was designed specifically to seal pitted, warped or wavy flanges. Featuring soft, compressible outer layers and a rigid PTFE inner core, Style 3545 is ideal in situations where a rigid gasket is required, such as hard-to-reach piping systems, valves and flanges. The layers of rigid PTFE and microcellular PTFE are sandwiched together using the proprietary GYLON® thermal bonding process, rather than adhesives, for longer gasket life. Style 3545 is so innovative, it received the 1995 Vaaler award from *Chemical Processing* magazine.

UNLIMITED SIZES AND DIMENSIONS

With growing concern over fugitive emissions, the traditional dovetailing method of creating larger sized gaskets no longer met many customer demands. In response, Garlock created the Welded GYLON® process. Welded GYLON® eliminated dovetail leak paths and allowed the use of large gaskets without handling problems or premature blowout. Today, GYLON® gaskets can be thermally bond (without the use of any adhesive or low melt temperature polymers) to any size or dimension; another breakthrough for Garlock gasketing.

UNPARALLELED RELIABILITY AND SERVICE

The Garlock family of GYLON® products has evolved over the years with a focus on quality to meet and exceed customer expectations. The use of Employee Involvement, Statistical Process Control, Vendor Assurance Programs, and a continuous improvement philosophy continues to guarantee end users the highest quality products available.

Testing is performed regularly on all styles and thicknesses to ensure the consistency of Garlock quality in GYLON® sheets. Quality American-made products, 47 years of experience, on-time delivery and value-added service programs, all are reasons why the GYLON® family of products has become such a major sealing component in industry today.

There is no doubt that demands will change in the future. But one thing is certain—Garlock will continue to answer those changes and demands with products that are innovative and timely. GYLON®, a name you can trust and a complete family of products to choose from for your gasketing needs.

* PTFE – polytetrafluoroethylene

GYLON® Gasketing

TYPICAL PHYSICAL PROPERTIES*

GYLON® STYLES		3500	3504	3504	3510	3522
Color		Fawn GYLON®	Blue GYLON®	Blue GYLON® Stress Saver	Off-white GYLON®	GYLON® Diaphragm
Composition		PTFE with silica	PTFE with glass microspheres	PTFE with glass microspheres	PTFE with barium sulfate	PTFE
Temperature	Min. Cont. Max.	-450°F (-268°C) 500°F (260°C)	-450°F (-268°C) 500°F (260°C)	-450°F (-268°C) 500°F (260°C)	-450°F (-268°C) 500°F (260°C)	 500°F (260°C)
Pressure	psig. Cont. max (bar)	1,200 (83)	800 (55)	800 (55)	1,200 (83)	Consult Engineering
P x T, Max.[1] **psig x °F** **(bar x °C)**	1/32", 1/16" (0.8mm, 1.6mm) 1/8" (3.2mm)	350,000 (12,000) 250,000 (8,600)	350,000 (12,000) 250,000 (8,600)	350,000 (12,000) 250,000 (8,600)	350,000 (12,000) 250,000 (8,600)	Consult Engineering
Sealability	ASTM Fuel A ml/hr (ASTM F37B[3]	0.22	0.12	--	0.04	--
Gas Permeability	cc/min. (DIN 3535 Part 4)[4]	<0.015	<0.015	<0.015	<0.015	--
Creep Relaxation	% (ASTM F38)	18	40	--	11	35
Compressibility	Range % (ASTM F36)	7-12	25-45	12	4-10	20-25
Recovery	% (ASTM F36)	>40	>30	>50	>40	>50
Tensile Strength	psi (ASTM D1708) (N/mm^2)	2,000 (14)	2,000 (14)	2,000 (14)	2,000 (14)	5,000 (34)
Flammability		Will not support flame				
Bacterial Growth		Will not support				

Notes:

1. Based on ANSI RF flanges at our preferred torque. When approaching maximum pressure, temperature or 50% of maximum PxT, consult Garlock Engineering. For Styles HP 3560 and HP 3561, consult Garlock if approaching maximum temperature, or 50% of maximum pressure or P x T.
2. For 3565, HP 3560 and HP 3561, 1/16" thickness only; for 3535, 1/4" thickness only.
3. ASTM F37B Sealability, milliliters/hour (1/32" thick)
   ASTM Fuel A (isooctane):
   Gasket load = 1,000 psi (7 N/mm^2),
   Internal pressure = 9.8 psig (0.7 bar)
4. DIN 3535 Part 4 Gas Permeability, cc/min. (1/16" thick)
   Nitrogen: Internal pressure = 580 psig (40 bar),
   Gasket load = 4,640 psi (32 N/mm^2)

This is a general guide and should not be the sole means of selecting or rejecting this material. ASTM test results in accordance with ASTM F-104; properties based on 1/32" (0.8mm) sheet thickness, except Style 3565 and Style 3545 based on 1/16" (1.6mm).

*** Values do not constitute specification limits**

GYLON® : Family of PTFE gaskets

3540	3545	3560	3561	3565
White GYLON®	White GYLON®	Fawn metal inserted GYLON®	Off-white metal inserted GYLON®	ENVELON® GYLON®
Microcellular PTFE	Microcellular PTFE	GYLON® with perforated 316LSS insert	GYLON® with perforated 316LSS insert	PTFE with glass
-450°F (-268°C) 500°F (260°C)	-450°F (-268°C) 500°F (260°C)	--- --- 500°F (260°C)	--- --- 500°F (260°C)	-450°F (-268°C) 500°F (260°C)
1,200 (83)	1,200 (83)	2,500 (172)	2,500 (172)	2,500 (172)
350,000 (12,000) 250,000 (8,600)	350,000 (12,000) 250,000 (8,600)	700,000 (25,000) 450,000 (15,000)	700,000 (25,000) 450,000 (15,000)	350,000 (12,000) 250,000 (8,600)
0.25	0.15	0.2[2]	0.1[2]	0.33[2]
<0.015	<0.015	<0.015[2]	<0.015[2]	<0.015[2]
10	15	20[2]	20[2]	35[2]
70-85	60-70	4-9[2]	3-7[2]	35-50[2]
>8	>15	>45[2]	>50[2]	>35[2]
-- --	-- --	5,000[2] (34)	5,000[2] (34)	1,800[2] (13)
Will not support flame				
Will not support				

TEST DATA

Before

Compression at 2,000 psi (14 N/mm²)
for 1 hour at 500°F (260°C)

After

◀ Note the uneven cold flow shown by conventional PTFE.

For questions call gasket applications engineering at 1-315-597-4811

GYLON® Styles 3500 to 3510

BENEFITS

Tighter Seal

- » Improved performance over conventional PTFE
- » Reduced product loss and emissions

Reduced creep relaxation

- » Unique manufacturing process minimizes cold flow problems typical of skived and expanded PTFE sheets
- » Excellent bolt torque retention

Chemical resistance

- » Withstands a wide range of chemicals for extended service life in a wide variety of applications

Cost savings

- » Cuts operational costs through reduced:
  - Fluid loss
  - Energy consumption
  - Maintenance costs
  - Inventory costs
  - Waste

Largest sheet sizes*

- » Offers some of the largest sheet sizes in the industry
- » Improved material utilization reduces waste

Branding and color coding

- » Easy identification of superior GYLON® products
- » Reduces misapplication and use of unauthorized, inferior substitutes

* 60" x 60" (1524 mm x 1524 mm), 70" x 70" (1778 mm x 1778 mm), 60" x 90" (1524 mm x 2286 mm)

Media

GYLON® 3500: Strong acids (except hydrofluoric), solvents, hydrocarbons, water, steam, chlorine, and cryogenics. Conforms to FDA regulations. (For oxygen service, specify "Style 3502 for oxygen service.")

GYLON® 3504: Moderate concentrations of acids and some caustics, hydrocarbons, solvents, water, refrigerants, and cryogenics. Conforms to FDA regulations. (For oxygen service, or NSF-61 potable water service specify "Style 3505 for oxygen service.")

GYLON® 3504: STRESS SAVER Moderate concentrations of acids, caustics, solvents, refrigerants, cryogenics, hydrocarbons and hydrogen peroxide. Conforms to FDA regulations and USP Class VI (US Pharmacopeia), Specify 3505 for NSF 61 (National Sanitation Foundation) potable water service.

GYLON® 3510: Strong caustics, moderate acids, chlorine, gases, water, steam, hydrocarbons, and cryogenics. Conforms to FDA regulations. (For oxygen service, specify "Style 3503 for oxygen service.")

Thermally Bonded GYLON®

BENEFITS

Effective seal

- » Patented bonding process produces large gaskets without dove-tailed joints that permit leakage
- » GYLON® material provides the excellent chemical resistance of PTFE without creep relaxation and cold flow problems

Versatile

- » Ideal for corrosive applications with extra-large flanges
- » Styles 3500, 3504, 3510, 3540, HP 3560, HP 3561 and 3565 can all be thermally bonded using this process

Style 3535 Joint Sealant

BENEFITS

Chemical resistance

- » Pure PTFE is chemically inert, withstands a wide range of chemicals
- » Conforms to FDA regulations

Easy to install

- » Continuous length on spools is easily cut and formed
- » Strong adhesive backing aids installation on narrow or hard-to-reach flanges
- » Available in widths from 1/8" to 1"

Typical Physical Properties

Sealability	(ASTM F37B)[1] ml/hr	0.1
Gas Permeability	(DIN 3535 Part 4)[2] cc/min.	0.05
Temperature	-450°F (-268°C) to 500°F (260°C)	
Pressure	800 psig max.	

Notes:

[1] ASTM F37B Sealability, milliliters/hour (1/4" thick)
ASTM Fuel A (isooctane):
Gasket load: 3,000 psi (20.7 N/mm²), Internal pressure: 30 psig (2 bar)

[2] DIN 3535 Part 4 Gas Permeability, cc/min. (1/4" thick)
Nitrogen:
Internal pressure: 580 psig (40 bar), Gasket load: 4,640 psi (32 N/mm²)

GYLON® Style 3545

BENEFITS

Tighter seal

- » Highly compressible PTFE outer layers seal under low bolt load—suitable for many flat face and glass-lined flanges*
- » Compressible layers conform to surface irregularities, especially on warped, pitted or scratched flanges
- » Rigid PTFE core reduces cold flow and creep normally associated with conventional PTFE gaskets

Excellent chemical compatibility

- » Pure PTFE withstands a wide range of chemicals

Easy to cut and install

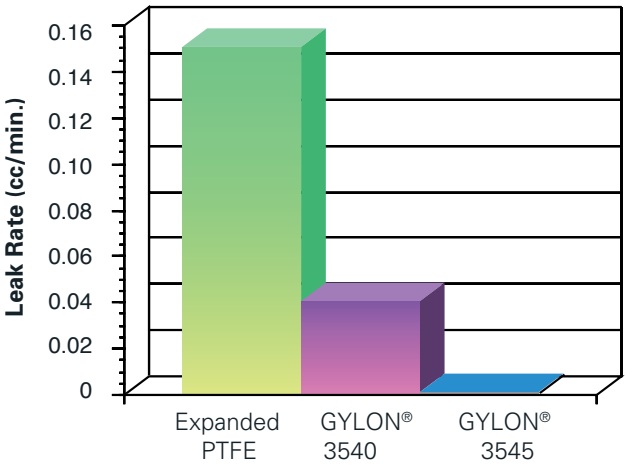
- » Soft PTFE can be cut easily from larger sheets, reducing inventory costs and expensive downtime
- » Rigid PTFE core facilitates installation, especially on large diameter flanges and hard-to-reach areas

GYLON® Style 3540

- » Pure microcellular PTFE
- » Similar to Style 3545, but without rigid core
- » Ideal for wavy, warped, pitted, or scratched flanges, and for many types of flat face flanges*

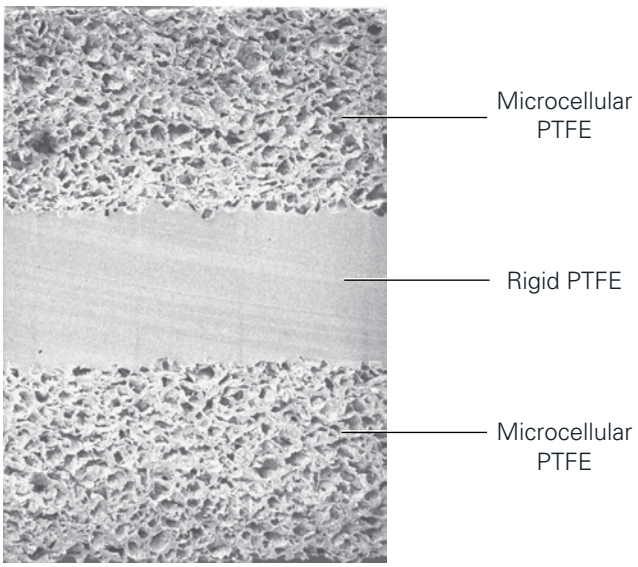
Test Results

DIN 3535 Gasket Permeation Test



Note the dramatically reduced leakage of GYLON® 3540 and 3545. Average of three tests, using 580 psig nitrogen with 4,640 psi gasket load according to DIN 3535 requirements. All samples 1/16" (1.6 mm) thick.

CONFIGURATION



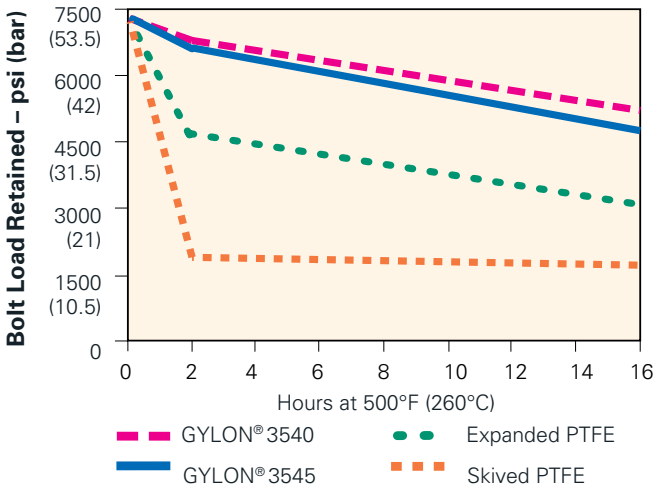
Cross-sectional view under electron microscope. All layers manufactured using proprietary GYLON® process thermally fused layers, without the use of adhesives.

Media

GYLON® 3540: Strong caustics, strong acids, hydrocarbons, chlorine, and cryogenics. Conforms to FDA regulations.

GYLON® 3545: Strong caustics, strong acids, hydrocarbons, chlorine, cryogenics and glass-lined equipment. Conforms to FDA regulations.

DIN 52913 Gasket Bolt Load vs. Time



High bolt load retention of GYLON® 3540 and 3545, especially at high temperatures, indicates gasket is less likely to incur gross leakage (blowout).

* For flat face flanges, a minimum compressive stress of 1,500 psi (103 N/mm²) is recommended on the contacted gasket area for 150 psig (10.3 N/mm²) liquid service. Consult with the flange manufacturer to confirm that adequate compressive stress is available.

GYLON® Styles HP 3560 / HP 3561

BENEFITS

Tight seal

- » Perforated stainless steel core increases resistance to pressure fluctuations and thermal cycling
- » GYLON® offers superior cold flow and creep resistance, eliminating the need for frequent retorquing

Chemical resistance

- » Seals aggressive chemicals in hostile environments where safety or blowout resistance is crucial*

GYLON® Style 3565 ENVELON® Gasketing

BENEFITS

Tighter seal

- » Soft, deformable exterior conforms to surface irregularities; ideal for worn, warped or pitted flanges
- » Stable blue core improves cold flow resistance
- » Low bolt load requirements ensure a tight seal on glass-lined or wavy flanges†
- » Direct sintering of GYLON® layers prevents leak paths and adhesive contamination

Easy to install

- » Unitized construction avoids jacket fold over
- » Rigid core facilitates installation of large gaskets

Minimizes inventory

- » Custom-cut gaskets from large sheets offer convenience while reducing costly inventory buildup
- » Ideal replacement for slit, milled, formed shield and double jacketed envelope gaskets†

* Consult Garlock Applications Engineering when using flanges in pressure classes above 300 lbs.

** Patents #4,961,891; #4,900,629

† When sealing uneven flanges, gasket must be four times thicker than maximum gap between flanges.

Media

HP 3560: Strong acids (except hydrofluoric), solvents, hydrocarbons, water, steam, chlorine, and cryogenics (For oxygen service, specify "HP 3562 for oxygen service.")

HP 3561: Strong caustics, moderate acids, chlorine, gases, water, steam, hydrocarbons, and cryogenic (For oxygen service, specify "HP 3563 for oxygen service.")

Style 3565: ENVELON® Moderate concentrations of acids and caustics, hydrocarbons, solvents, cryogenics, and glass-lined equipment. Conforms to FDA regulations.

For questions call gasket applications engineering at 1-315-597-4811

BEFORE INSTALLATION

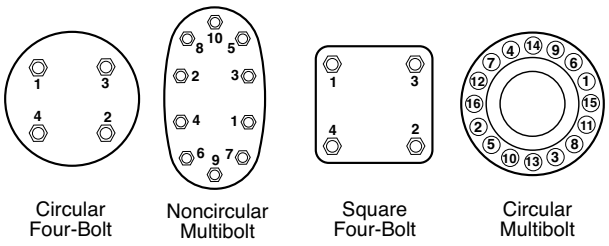
- Remove old gasket, and clean flange surface of all debris. For best results, use a metal flange scraper, an aerosol gasket remover and a wire brush, then inspect the flange for damage. Be sure surface finish and flatness are satisfactory.
- Use the thinnest possible gasket. However, flanges that are warped, bowed or severely pitted require thicker gaskets.
- Whenever possible, use ring gaskets. Full face gaskets have more surface area, requiring additional compressive load on the gasket.
- Never use metal-based anti-seize on gaskets, since particles may accumulate in the surface imperfections, thereby creating a flange surface that is too smooth to be effective. Such coatings will also greatly impair the resistance of the gasket pressure.

INSTALLATION

- Center the gasket on the flange. This is extremely vital where raised faces are involved.

  Note: Standard ANSI ring gaskets, when properly cut, should center themselves when the bolts are in place.
- Use a torque wrench and well-lubricated fasteners with hardened flat washers to ensure correct initial loading.
- Tighten bolts to compress gasket uniformly. This means going from side to side around the joint in a star-like crossing pattern. See Figure 3 below.
- All bolts should be tightened in one-third increments, according to proper bolting patterns.
- Retorque 12 to 24 hours after start-up, whenever possible. All applicable safety standards including lockout/tagout procedure should be observed.
- Never use liquid or metallic based anti-stick or lubricating compounds on the gaskets. Premature failure could occur as a result.

Figure 3: Correct Bolting Patterns



"M" AND "Y" DATA

"M" and "Y" data are to be used for flange designs only as specified in the ASME Boiler and Pressure Vessel Code Division 1, Section VIII, Appendix 2. They are not meant to be used as gasket seating stress values in actual service. Our bolt torque tables give that information and should be used as such.

"M" - Maintenance Factor

A factor that provides the additional preload needed in the flange fasteners to maintain the compressive load on a gasket after internal pressure is applied to a joint. The net operating stress on a pressurized gasket should be at least (m) x (design pressure, psi).

"Y" - Minimum Design Seating Stress

The minimum compressive stress in pounds per square inch (or bar) on the contact area of the gasket that is required to provide a seal at an internal pressure of 2 psig (0.14 bar).

Style	Thickness	M	Y (psi)
3500	1/16″ 1/8″	5.0 5.0	2,750 3,500
3504	1/16″ 1/8″ 3/16″ 1/4″	3.0 2.5 2.5 2.5	1,650 3,000 3,000 3,000
3510	1/16″ 1/8″	2.0 2.0	2,350 2,500
3535	1/4″	2.0	3,000
3540	1/16″ 1/8″ 3/16″ 1/4″	3.0 3.0 2.0 3.0	1,700 2,200 2,200 2,500
3545 **(in envelope)**	1/16″ 1/8″ 3/16″ 1/4″ 1/8″	2.6 2.0 2.0 7.0 2.0	1,500 2,200 2,200 3,700 800
HP 3560	1/16″ 1/8″	5.0 5.0	3,500 4,000
HP 3561	1/16″ 1/8″	5.0 5.0	3,500 4,000
3565	1/16″ 1/8″ 3/16″ 1/4″	2.8 3.7 5.5 6.0	1,400 2,300 2,800 2,800

Gasket Constants

Style	Thickness	Gb	a	Gs	S100	S1000	S3000	S5000	S10000	Tpmin	Tpmax
3500	1/16″	949	0.253	2.60E+00	3,043	5,448	7,194	8,187	9,756	373	16,890
	1/8″	1980	0.169	3.93E-01	4,313	6,365	7,663	8,354	9,393	223	25,375
3504	1/16″	183	0.357	4.01E-03	947	2,155	3,190	3,828	4,903	3,097	14,817
	1/8″	1008	0.221	2.23E+00	2,793	4,649	5,928	6,638	7,739	141	72,992
3510	1/16″	289	0.274	6.61E-11	1,021	1,918	2,592	2,981	3,605	11,881	25,501
	1/8″	444	0.332	1.29E-02	2,048	4,399	6,336	7,507	9,449	1,770	17,550
3535	3/8″	430	0.286	1.69E-09	1,605	3,101	4,245	4,913	5,991	373	
3540	1/16″	550	0.304	7.64E-01	2,230	4,491	6,272	7,326	9,044	973	23,670
3545	1/16″	162.1	0.379	1.35E-09	927	2,217	3,361	4,079	5,303	18,209	61,985
	1/8″	92.48	0.468	2.50E-03	799	2,349	3,930	4,992	6,907	4,460	53,307
	3/16″	628	0.249	7.93E-05	1.977	3,507	4,611	5,236	6,222	373	
3561	1/16″	72.3	0.466	2.16E-01	618	1,808	3,016	3,827	5,286	1,688	21,755

Gb = stress at which seal is initiated; "a" = the slope of the log/log tightness curve; Gs = intersection of the unload curve with the vertical axis (Tp1).

Note: For a 5" OD gasket at 800 psig, Tp100 = 102ml/min. leakage, Tp1,000 = 1.02ml/min. leakage, Tp10,000 = 0.01 ml/min. leakage.

Sheet Sizes

	60″ x 60″					70″ x 70″				60″ x 90″			40″ x 40″			24″ x 24″	
Style	**1/31″**	**1/16″**	**1/8″**	**3/16″**	**1/4″**	**1/32″**	**1/16″**	**1/8″**	**1/4″**	**1/32″**	**1/16″**	**1/8″**	**1/32″**	**1/16″**	**1/8″**	**1/16″**	**1/8″**
3500	•	•	•	•	•		•	•			•	•					
3504		•	•	•	•		•	•	•		•	•	•				
3510	•	•	•	•	•		•	•			•	•					
3540		•	•	•	•		•	•			•	•					
3545		•	•	•	•		•	•			•	•					
HP 3560																•	•
HP 3561																•	•
3565		•	•	•	•		•	•	•		•	•					

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