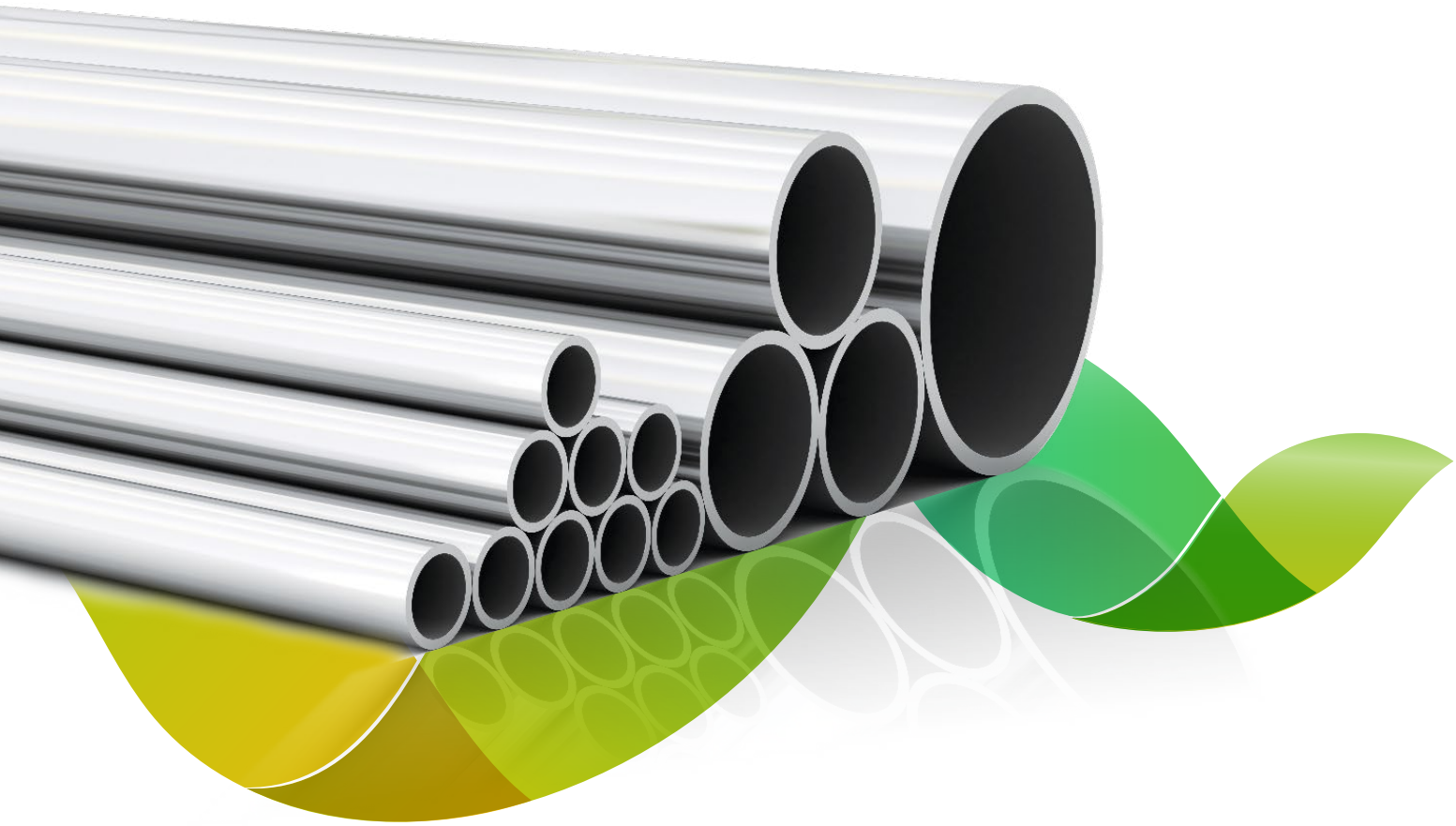
SCiMax®



SCiMax Tubes and Fittings

Specifications and Submittal Documentation

Semiconductor

NEUMO | HPT | EGMO
NEUMO Ehrenberg Group

SCiMax® Tubes and Fittings Specifications and Submittal Documentation

Products: Tubing and fittings for use in the semiconductor industry

Material: Stainless steel 316L

Sizes: ¼" O.D. up to 6" O.D

Surface finish: Electropolished / Mechanical Polished / Bright Annealed

Reference Standards

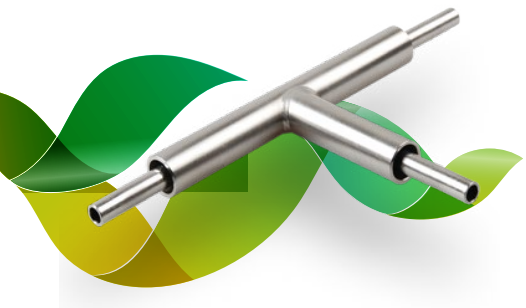
ASTM Specifications	▪ ASTM A269, A270-S2: Standard specification for seamless or welded austenitic stainless-steel tubing for general uses ▪ ASTM A632, Standard specification for seamless or welded austenitic stainless-steel tubing (Small diameters) for general uses ▪ ASTM A262: E, recommended practices for detecting susceptibility to intergranular attack in austenitic stainless steel ▪ ASTM E112: Standard Test Methods for Determining Average Grain Size ▪ ASTM A967 Passivation process ▪ ASTM A912 EP Process (when applicable) ▪ ASME B46.1, ASTM A213, SA 213, ASTM 312
CGA G-4.1	▪ Cleaning Equipment
SEMI F17	▪ Specification for Ultra High Purity Electropolished and High Purity Mechanical Polished (MP) / Bright Annealed 316L Stainless steel tubing and tubular fittings

Material characteristics

Manufacturing	▪ ¼" - 1" (include): Seamless ▪ 1" - 6": Welded
Sulfur content*	▪ ¼" - 1": 0.005 - 0.010% ▪ 1" - 6": 0.005 - 0.017%
Tube Annealing Process	▪ Bright Annealed in dry hydrogen atmosphere

** Seamless material - 0.005 to 0.010 %*
Welded and bar stock material - 0.005 to 0.017 %

Coax sleeves are fillet welded and the sulfur content may be up to 0.03



Mechanical Properties

Yield strength offset (0.2%)	Tensile strength	Elongation (in 2″ (50mm))	Reduction	Hardness
170 (N/mm²) min	485 (N/mm²) min	40%	N/A	Max. 95 HRB

Tubing Working Pressure

Size OD Tube	Nominal Wall Thickness	AISI 316L (1.4404)		
		Working Pressure (psi/bar)*	Yield Pressure (psi/bar)	Burst Pressure (psi/bar)
¼″	.035	5941/410	8436/582	20400/1407
⅜″	.035	3835/265	5445/375	13200/910
½″	.049	4550/314	6500/448	18200/1255
¾″	.065	3030/209	4300/296	12100/834
1″	.065	2280/157	3300/227	9100/627
1½″	.065	1520/105	2200/152	6100/421
2″	.065	1140/79	1600/110	4600/317
2½″	.065	910/63	1300/90	3600/248
3″	.065	760/52	1100/76	3000/207
4″	.083	730/50	1000/69	2900/200
6″	.109	640/44	900/62	2500/172

* *Working pressure is calculated from an S value of 20 000 psi (137.8 MPa) for ASTM A269 tubing at –20 to 100°F (–28 to 37°C), as listed in ASME B31.3*

High Temperature Pressure Rating

* *For high-temperature pressure rating, multiply the working pressure by the Ratio seen below*

°F	°C	Ratio
200	93	1.00
400	204	0.96
600	315	0.85
800	426	0.79
1000	537	0.76

Surface roughness - SEMI F17 & ASME B46.1

Tube and fitting Code	Description	Roughness - Ra measurements [µ-inch]	
		Inner Diameter	Outer Diameter
EP	Electropolished	Ra max ≤ 10*	Ra max ≤ 32
MP/BA	Mechanical Polished (MP) / Bright Annealed (BA)	Ra max ≤ 20	Ra max ≤ 32

* *For products >1″: Ra ave. 10 µInch*

Ra (maximum or average) is not specified and may vary in welds and cold-worked areas

Tube and Fittings Tolerances

Tubing specifications, ASTM A269 / A270 / A632

Tubing Diameter	Wall Thickness	OD Dimensional Specifications	Length*	Wall Thickness Tolerance
		ASTM Spec.	ASTM Spec.	ASTM Spec.
¼″	.035″	+.004″/-.000″	-0+1/8″	+/-10%
⅜″	.035″	+.004″/-.000″	-0+1/8″	+/-10%
½″	.049″	+.005″/-.005″	-0+1/8″	+/-10%
¾″	.065″	+.005″/-.005″	-0+1/8″	+/-10%
1″	.065″	+.005″/-.005″	-0+1/8″	+/-10%
1½″	.065″	+.010″/-.010″	-0+1/8″	+/-10%
2″	.065″	+.010″/-.010″	-0+1/8″	+/-10%
2½″	.065″	+.010″/-.010″	-0+1/8″	+/-10%
3″	.065″	+.010″/-.010″	-0+1/8″	+/-10%
4″	.083″	+.015″/-.015″	-0+1/8″	+/-10%
6″	.109″	+.030″/-.030″	-0+1/8″	+/-10%

Tube Face End-Square Tolerance

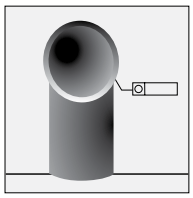
OD Size [Inch]	¼″ - ¾″	1″ - 2″	2½″	3″ - 4″	6″
	0.005	0.008	0.01	0.016	0.03

Fitting Tolerances

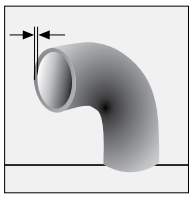
Nominal OD Size	¼″	3/8″	½″	¾″	1″	1½″	2″	2½″	3″	4″	6″
O.D. Tolerance	±.005	±.005	±.005	±.005	±.005	±.008	±.008	±.010	±.010	±.015	±.030
Nominal Wall Thickness	.035	.035	.049	.065	.065	.065	.065	.065	.065	.083	.109
Wall Thickness Tolerance before EP	+.003/ - .004	+.003/ - .004	+.005/ - .008	+.005/ - .008	+.005/ - .008	+.005/ - .008	+.005/ - .008	+.005/ - .008	+.005/ - .008	+.008/ - .010	+.015/ - .015
Wall Thickness Tolerance after EP	+.005/ - .010	+.005/ - .010	+.005/ - .010	+.005/ - .010	+.005/ - .010	+.005/ - .010	+.005/ - .010	+.005/ - .010	+.005/ - .010	+.008/ - .012	+.015/ - .017
Control Length (C)	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750
Tangent Length (T)	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.750	2.000	2.500
Squareness Face to Tangent (B)	.005	.005	.005	.005	.008	.008	.008	.010	.016	.016	.030
Off Angle (O)	.009	.012	.014	.018	.025	.034	.043	.054	.068	.086	.135
Off Plane (P)	±.030	±.030	±.030	±.030	±.030	±.050	±.050	±.050	±.050	±.060	±.060

** All dimensions are in Inches*
Tubing specifications, ASTM A269 / A270 / A632

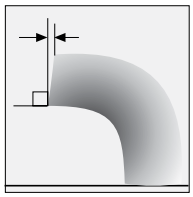
- Roundness



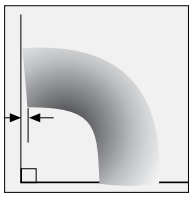
- Wall Thickness



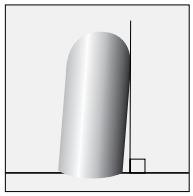
- Squareness Face to Tangent



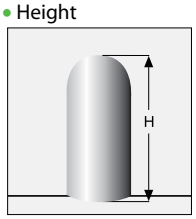
- Off Angle

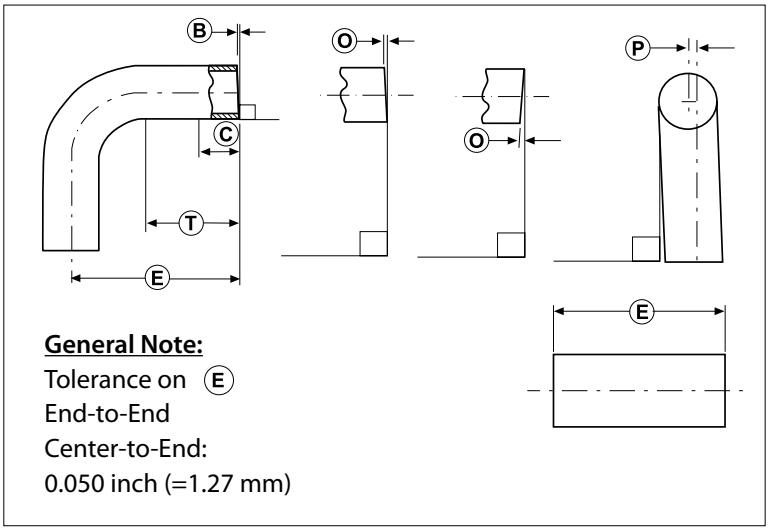


- Off Plane



- Height





General Note:
Tolerance on (E)
End-to-End
Center-to-End:
0.050 inch (=1.27 mm)

- All other tolerances per ASTM A270 / A269.
- The measured wall Thickness of each tubing batch should be reported as part of the certificate of test results.
- Each separate package should contain tubing with the same wall thickness, produced from the same ingot (i.e., a "BATCH") and the same nominal size (i.e., same O.D.).

Marking

Marking method - permanent	▪ Tubes - Engraving / Pin marking / Laser Mark ▪ Fittings - Laser Mark
Each product will be marked with the following details	▪ Brand Name: SciMax ▪ Job Number ▪ Size x Wall Thickness (in inch units) ▪ Material Grade ▪ Heat Number

Labeling

Each product is identified with a SCiMax label with the following:	▪ Brand Name: SciMax ▪ Job Number ▪ Size x Wall Thickness (in inch units) ▪ Material Grade ▪ Heat Number ▪ QR Code - to scan and download the MTR (Material Test Reports) from the web

Packing

EP Products	▪ EP products are cleaned with UPW 18MΩ, packed in a Class10 (ISO4) clean room and UHP N2 is used to purge. ▪ EP products are capped with mylar and red PE caps. ▪ EP products are packed with two layers nylon sleeves.
MP/BA Products	▪ MP/BA products are cleaned with DI-WATER, packed in a Class1,000 (ISO6) clean room and HP N2 is used to purge. ▪ MP/BA products are capped with mylar and yellow PE caps. ▪ MP/BA products are packed with one layer nylon sleeve.

- Tubes Length: 6.1 meters (20Ft) long
- Conventional Cargo - wooden crates

Documentation / Certification

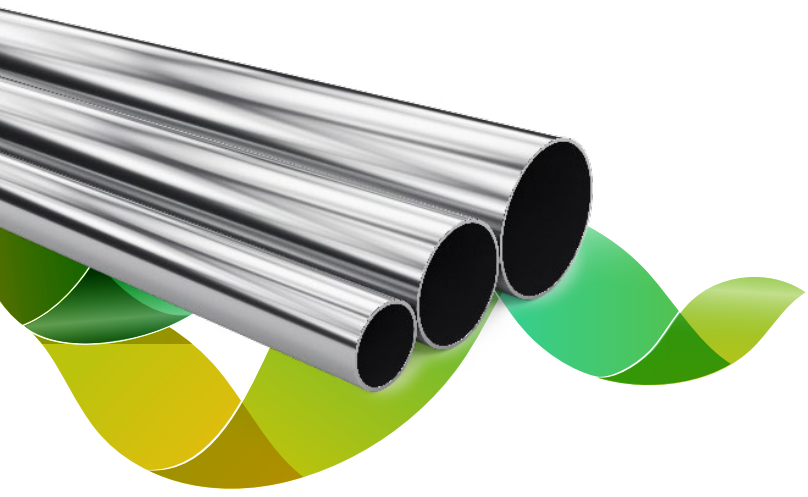
- The MTR (Material Test Reports) are supplied with the finished products.
- Inspection documents certification to be according to standards in page 6.

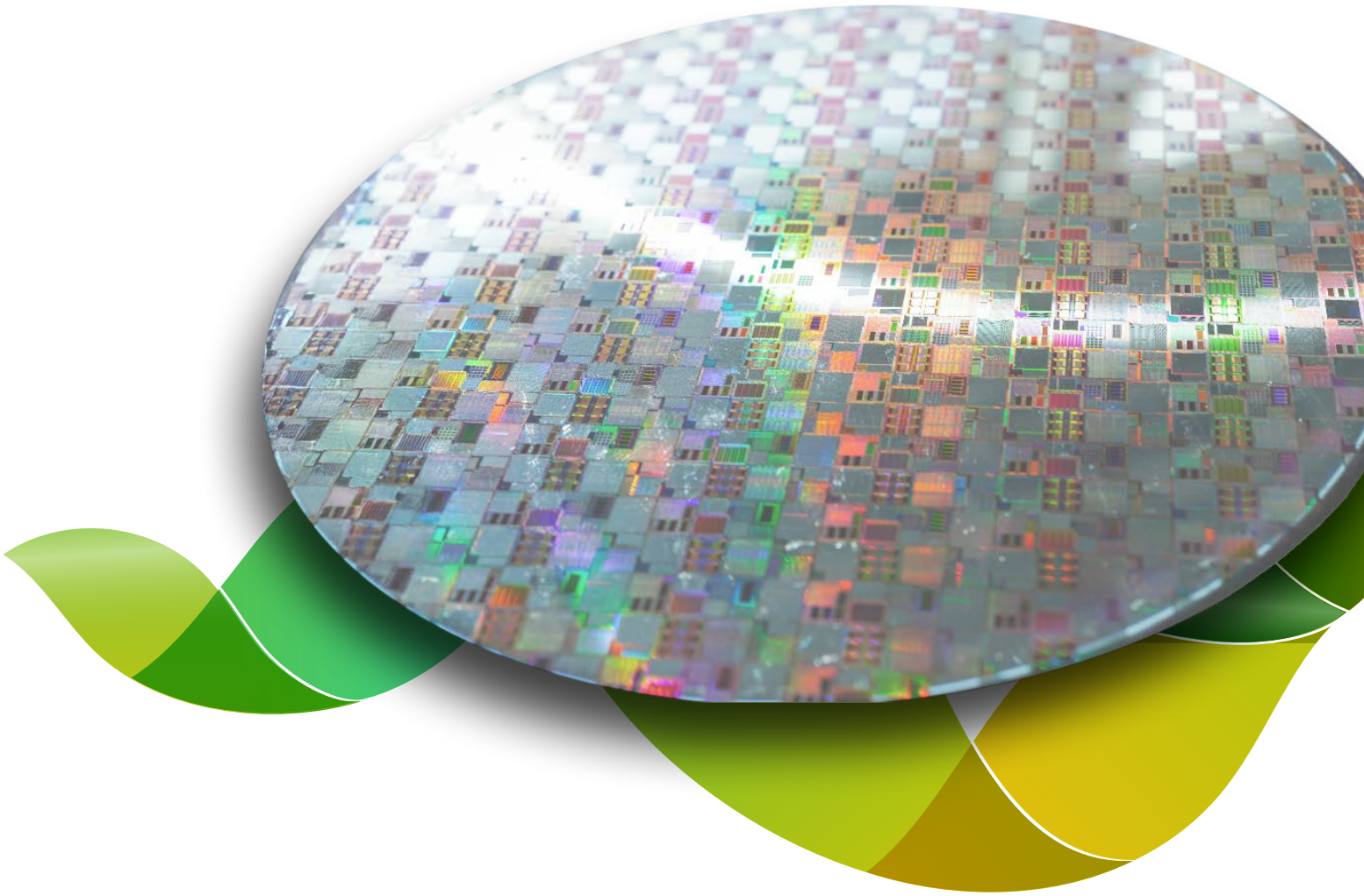
Inspection Tests and Documentation

Summary table of testing, inspection and certification that can be given per our process.

Description	Standard / Value	SCiMax10	SCiMax20
Material Composition	ASTM A269, A270, A632, A-213, SA-213	✓	✓
Mechanical Tests	ASTM A269, A632	✓	✓
Visual Inspection 100%	Internal procedure	✓	✓
Dimensional Measurements	ANSI B31.3	✓	✓
Hydrocarbon Cleaning Inspection	CGA G-4.1	✓	✓
Helium Leak Test for Welded Fittings	$1*10^{-9}$ scc/sec	✓	✓
Inspection Certification	EN 10204 3.1	✓	✓
Ra Measurements	ASME B46.1	✓	✓
Particles Test	<10 particles (greater than 0.1µ ft^3)	✓	
Moisture Test for Tube: Additional Moisture on UHP N2 Purged Gas	Δ0.5 ppm	✓	
Ultra Pure Water Resistivity	18 MΩ	✓	
SEM TEST - Scanning Electron Microscopy for Defects	SEMATECH 90120401B 50 defects (magnification*3600)	✓	
XPS TEST - X Ray Photoelectron Spectroscopy for Analysis of Cr / Fe	SEMATECH 90120403B > 1.5/1	✓	
XPS TEST - X Ray Photoelectron Spectroscopy for Analysis of Cr ox / Fe ox	SEMATECH 90120403B > 2/1	✓	
AES TEST - Auger Electron Spectroscopy for Measuring of Oxide Thickness	SEMATECH 91060573B > 20A	✓	

All products SCiMax10 and SCiMax20 are CFOS





NEUMO EHRENBERG GROUP
GLOBAL LOCATIONS



NEUMO GmbH+Co. KG (D)
Tel: +49 (0) 7043 36 0
Fax: +49 (0) 7043 36 179
E-Mail: info@neumo.de
www.neumo.de
GERMANY



NEUMO-EGMO Spain S.L
Tel: +34 977 524 914
Fax: +34 977 524 898
E-Mail: neumo-es@neumo-es.com
www.neumo-es.com
SPAIN



Tel: +33 665 00 2201
E-Mail: france@neumo-es.com
FRANCE



NEUMO Italy S.r.l.
Tel: +39 0155821893
E-Mail: sales@neumo.it
ITALY



NEUMO Polska Sp. z.o.o
Tel: +48 (0) 46 833 4306
Fax: +48 (0) 46 832 5626
E-Mail: neumo@neumo.pl
POLAND



NEUMO LLC
Tel: +84 908475382
E-Mail: Minh.Vietnam@neumo.de
www.awh.eu
VIETNAM



AWH Armaturenwerke (D)
Hötensleben GmbH
Tel: +49 (0) 39405 92 0
Fax: +49 (0) 39405 92 111
E-Mail: info@awh.de
www.awh.de

Damstahl GmbH (D)
Tel: +49 (0) 2173 797 0
Fax: +49 (0) 2173 797 274
E-Mail: ds@damstahl.de
www.damstahl.de

Gebr. Rieger GmbH+Co. KG (D)
Tel: +49 (0) 7361 5702 0
Fax: +49 (0) 7361 5702 51
E-Mail: info@rr-rieger.de
www.rr-rieger.de
GERMANY



VNE Corporation
Tel: +1 800 356 1111
+1 608 756 4930
Fax: +1 608 756 3643
E-Mail: stainless@vnecorp.com
www.vnestainless.com
U.S.A



HPT Inc.
Tel: +845.452.1103
+800.284.4478
E-Mail: sales@hptinc.com
http://www.hptinc.com/
U.S.A



NEUMO Turkey
Tel: +90 (212) 875 01 41
Fax: +90 (212) 875 23 13
E-Mail: info@neumo.com.tr
www.neumo.com.tr
TURKEY



NEUMO - VARGUS (Shanghai)
Trading Co., Ltd
Tel: +86 (21) 51688300
Fax: +86 (21) 51688380
E - Mail: info@neumo.com.cn
CHINA



EGMO Ireland
Tel: +353 (0)21 4975540
Cel: +353 (0)87 2330469
E-Mail: dosullivan@flowsolutions.ie
www.egmo.co.il
IRELAND



Damstahl a/s Oslo (N)
Tel: +47 5615 1570
Fax: +47 5615 1571
E-Mail: dano@damstahl.com
www.damstahl.no
NORWAY



EGMO Ltd.
Tel: +972 (0) 4 9855 176
+972 (0) 4 9855 111
Fax: +972 (0) 4 9855 175
E-Mail: salese@egmo.co.il
www.egmo.co.il
ISRAEL



Herrli AG
Tel: +41 (0) 31 750 12 11
Fax: +41 (0) 31 750 12 00
E-Mail: info@herrli.net
www.herrli.net
SWITZERLAND



NEUMO Budapest Kft
Tel: +36 (1) 3174177
+36 (1) 3185982
Fax: +36 (1) 266 8765
E-Mail: neumo@neumo.hu
www.neumo.hu
HUNGARY



NEUMO UK Ltd.
Tel: +44 (0) 1952 583 999
Fax: +44 (0) 1952 583 958
E-Mail: stainless@neumo.co.uk
www.neumo.co.uk
UNITED KINGDOM



Damstahl a/s (Denmark)
Tel: +45 (0) 8794 4000
Fax: +45 (0) 8794 4150
E-Mail: ds@damstahl.com
www.damstahl.dk
DENMARK



Damstahl a/b (Sweden)
Tel: +46 87 61 71 00
Fax: +46 87 61 14 05
www.damstahl.se
SWEDEN

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