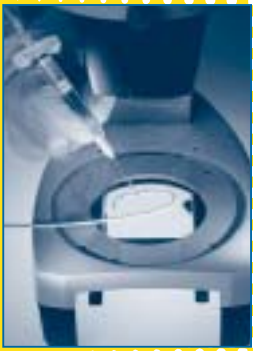

EFD®

A NORDSON COMPANY

Dispensing Solutions

EFD's mission:

To deliver world-class quality products and services with an uncompromising commitment and dedication to treating customers, suppliers and associates with respect and leadership, as we strive for continuous improvement.

EFD®
A NORDSON COMPANY

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tel +1-401-434-1680

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A new way of doing business with old-fashioned service.

Since 1963, EFD dispensing systems have helped thousands of companies make precise deposits of adhesives, lubricants and other assembly fluids.

From the Ultra™ line of disposable reservoir dispensers to high-performance valves to automated dispensing systems, EFD devices are used by manufacturers throughout the world.

Innovative design, unparalleled product performance, unwavering commitment to quality, and old-fashioned customer support make EFD the leader in the diverse markets we serve.

Today, the company does business on the same principles on which we were founded: to help our customers make better products, in less time, at lower cost.

We invite you to learn more, and look forward to working with you.

expect excellence

"We've nearly tripled the number of parts bonded per one-pound bottle of cyanoacrylate. We're saving $8,400 a year in adhesive costs alone."

—Jeff Dyer, Hi-Lex Controls

It's all about dispensing hard-to-handle assembly fluids.

Epoxies	Flux
Cyanoacrylates	Silicones
Solvents	Pastes, gels
Sealants	Electrolytes
Grease	Oils
Anaerobics	Activators
Lubricants	Marking inks
Coatings	UV cures

- Apply consistent dots, stripes, fills and coatings
- Cut fluid use up to 75%
- Reduce rejects and rework
- Double output without adding labor

Results are unconditionally guaranteed.

"We went from ten parts an hour to ten parts in less than five minutes—with a 70% reduction in adhesive use."

—Scott Powell, Flex Four Inc.

The ultimate dispensing system. So simple. So smart.

Making it simple is the philosophy behind EFD's Ultra™ Dispensing Systems. These powerful units offer consistent control for applying virtually any assembly fluid. Quick to set up on benchtop production lines, the units operate on shop air and electricity.

With each tap of the foot pedal, the system applies this same "push" on the fluid, allowing consistent deposits with no operator guesswork or effort required.

All wetted components are disposable, so no maintenance is ever required.

for details

www.efd-inc.com/dispensers.html

"The system was easy to set up, and is 10x more accurate than other **positive displacement** systems we tried. We plan to purchase up to 6 more units by year's end."

—Medical Device Manufacturer

No recalibration during operation

All electric

Menu-driven touch pad and Teach function

Variations in fluid viscosity, volume or temperature?

The Ultra™ 2800 DispensLink™ System is designed specifically for the application of fluids with changing viscosities.

The patented positive displacement technology of the Ultra 2800 is all electric with no shop air required. After initial setup, there is no need to recalibrate the dispense values to ensure the same deposit is applied each time.

A lightweight, flexible DispensLink™ connects the syringe barrel to the control unit.

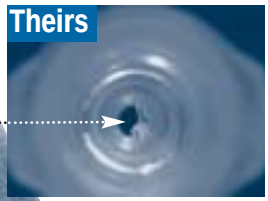
Repeatable, precise fluid control

No drooling

www.efd-inc.com/ultra2800

Which components would you rather use?

Theirs



"Flash" inside hub restricts flow and reduces accuracy.

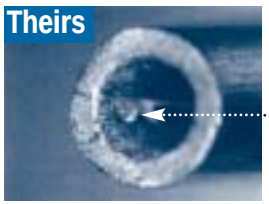
Ours

EFD hubs provide unrestricted flow and produce accurate consistent deposits.

Hubs

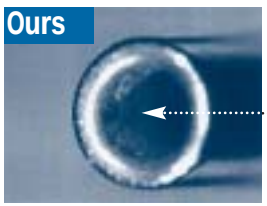
Needles

Theirs



Burrs and flaws inside reduce accuracy.

Ours



EFD needles are carefully polished and burr-free.

Fluid deposits are only as precise as the components used to make them.

You can have the most accurate dispensing equipment in the world, but if your disposable components (tips, syringe barrels and pistons) are of poor quality, you'll never achieve the accuracy you need (and paid for). Think about it—would you put a retread on a Ferrari?

If your dispense tip is blocked by metal burrs or "flash" from the molding process, the syringe barrel is contaminated with dust or silicone, or the syringe piston isn't a precise fit, the amount of fluid you apply is going to vary.

Unfortunately, most components look pretty similar from the outside. Companies who think they're saving money with "budget" tips, barrels and pistons often don't realize there's a difference until reject rates start to climb, or—even worse—their products fail in the field.

Consistent Components = Consistent Fluid Deposits

With EFD components, you'll never have to worry about these problems. All of our dispense tips, syringe barrels and pistons are precision molded in our own silicone-free US facilities, rigorously inspected and carefully packaged in clean, contaminant-free containers.

And to meet your specific application needs, we offer the largest selection of precision dispense tips in the industry—over 100 different styles and sizes—in stock and ready for immediate shipment.

For free samples or for a free syringe barrel and tip reference poster, visit our website.

www.efd-inc.com/poster

“ After 100 million cycles, we took the valve apart to check it. No repairs or parts needed. Reassembled and had it back in operation in about 5 minutes.”

—Engineer, Remington

50 million cycles & running: High performance valve systems.

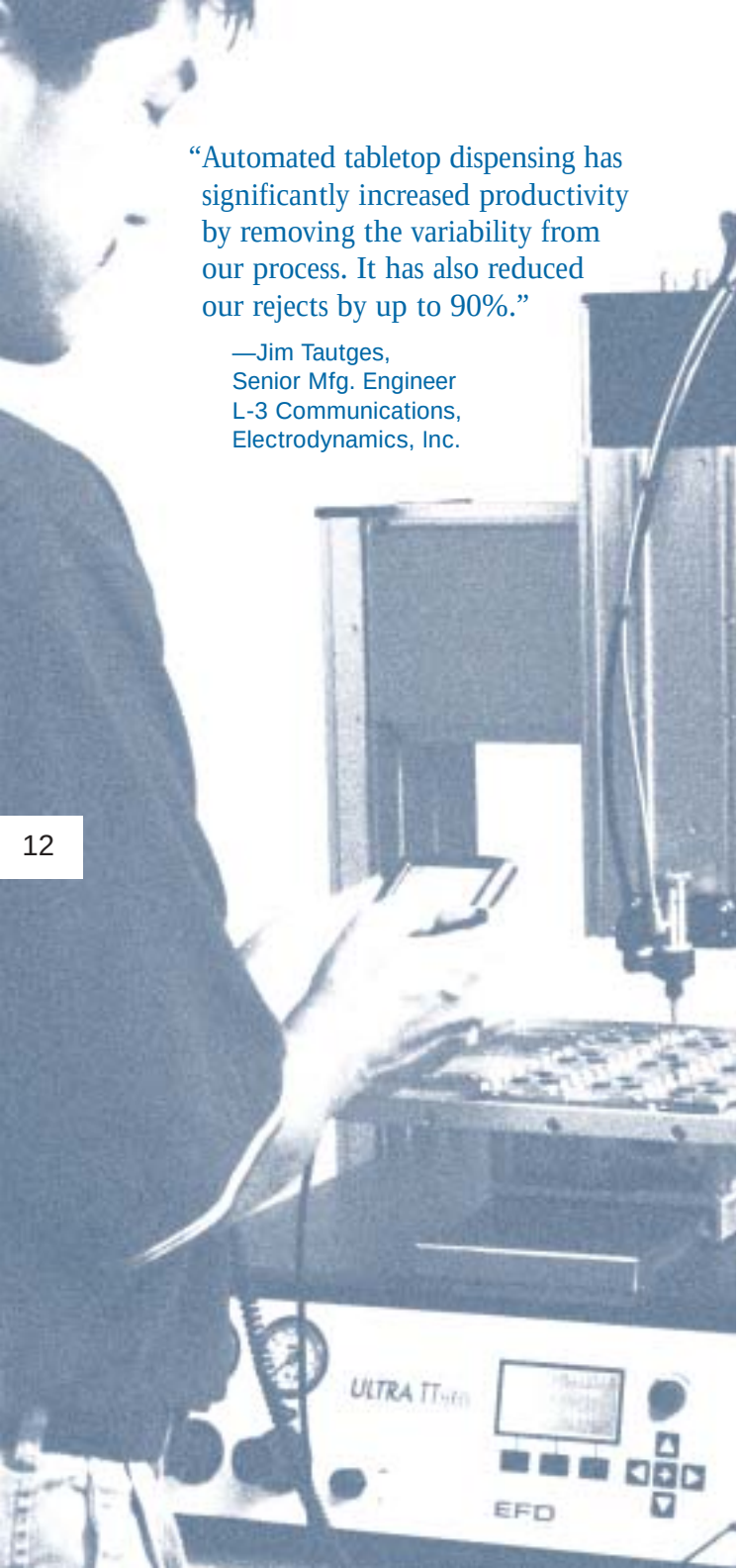
Engineered for the most demanding applications, EFD valves are so dependable, they’re often referred to as “boringly reliable.”

Designed for easy clean-up with minimal maintenance, these compact valves are built with stainless steel bodies and inert wetted components. Cycle rates exceed 500/minute, and unique seating designs ensure exceptionally clean fluid cutoff, with no dripping or drooling.

Just as important, the EFD ValveMate™ controller lets you make on-the-fly adjustments of deposit size—without interrupting production, complicated reprogramming or costly downtime. These controllers are designed for stand-alone operation or easily interface with a host PLC.

For details, visit

www.efd-inc.com/valveguide



"Automated tabletop dispensing has significantly increased productivity by removing the variability from our process. It has also reduced our rejects by up to 90%."

—Jim Tautges,
Senior Mfg. Engineer
L-3 Communications,
Electrodynamics, Inc.

XYZ Dispensing Systems: Increase yields, attain reliability.

Programming the new Ultra™ TT systems to automatically apply assembly fluids exactly where you want them is easier than ever.

Using a Palm™ handheld as a teach pendant, the units combine precise fluid dispensing and positioning into a small, tabletop system. The compact 3- or 4- axis systems use a closed-loop DC servo motor drive for exact positioning. Integrated dispensing controls allow instant hookup and permit the use of any EFD valve or syringe barrel.

An integrated height sensor and front panel controls for offset adjustment when changing a dispense tip add instant value to the system.

www.efd-inc.com/xyz

"Great paste and dispensers with excellent technical support and service minimize our storage and costs."

—Matthew Bailey, Filtronic Comtek

Unique solder formulations improve the process.

EFD SolderPlus® is uniquely formulated for air-powered dispensing. It suspends solder particles and prevents flux/metal separation, so it neatly sticks where you apply it, even on vertical surfaces. SolderPlus instantly replaces solder wire, preforms and conventional solder pastes with unmatched performance.

For rework or electronic assembly applications which require only flux, FluxPlus™ is a high-tack formulation that ensures fast, controlled results for dispensing or printing.

In the SMT industry, the 24-hour working life of PrintPlus™ solder paste established the benchmark for exceptional printing and handling characteristics.

All EFD solder and flux formulations can be shipped within three days.

www.efdsolder.com

ISO 9001:2000 Certified

Cert No. 81960

EFD Solder Paste Operations

"Consistent lubrication gives us 35% to 40% more strokes per minute and 50% more hits between sharpenings."

—Dennis Herdegen, V.P. Manufacturing, ETCO Inc.

Apply lubricants in exact amounts. No more. No less.

EFD's innovative MicroCoat® system applies lubricants and coatings in a fine, even film – in just the amount you specify. This unique, fully integrated system uses low-volume low-pressure (LVLP) air technology to provide steady, consistent lubrication without overspray or mist.

Increased process control means significant savings and increased press performance. Tools last longer and presses run faster. Your stamping operation becomes environmentally friendly, while problems from drip pads, rollers and airless spray systems disappear. Oil adjustments can be made on-the-fly, increasing productivity. In fact, manufacturers worldwide are reporting savings of 60% to 90% in oil usage.

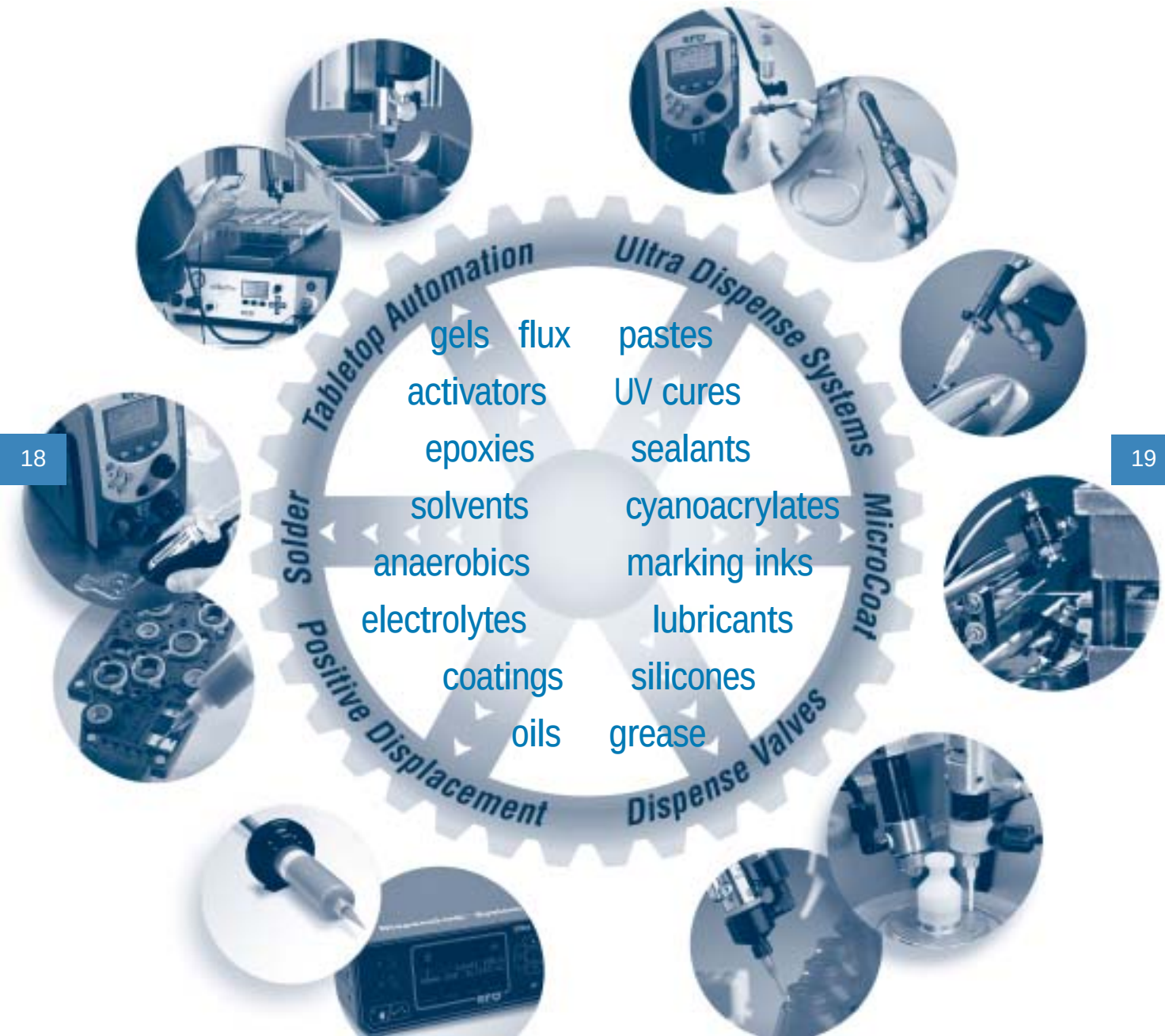
Ideal for metal stamping, metal forming, canning, non-wovens and heat exchange, the MicroCoat system will change the way you view lubrication.

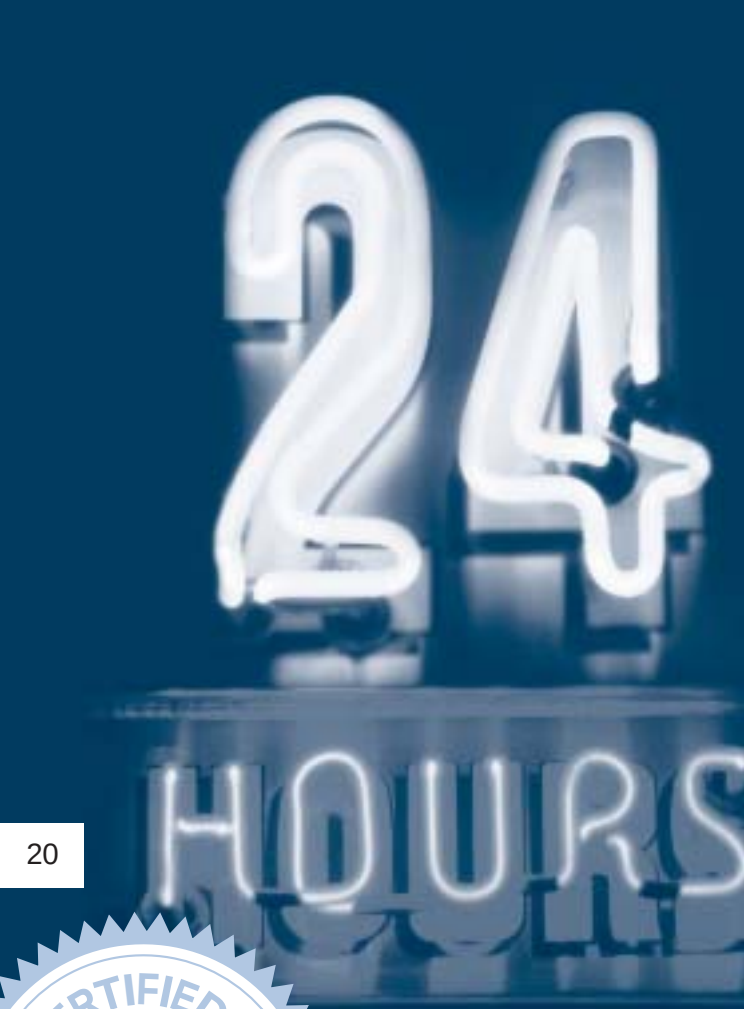
www.efd-microcoat.com

MicroCoat®

Add up the savings

EFD has a system for every fluid and application.





CERTIFIED • made by EFD in the U.S.A. • FOR INDUSTRIAL USE

- Product orders shipped within 24 hours.
- Customer support staff in locations worldwide.
- Products inspected to tolerances within +/-.0005".

No shortcuts on quality.

EFD is about quality. From manufacturing and shipping to invoicing and application support – we are driven to be the best. That focus on quality is evident in every product we make. We manufacture all EFD equipment in our own controlled, silicone-free facilities, ensuring that it is made the right way. Our way.

Higher quality translates into lower costs for our customers. That's why we track, monitor and measure all our internal processes – from engineering to the manufacturing floor – guaranteeing that we meet stringent standards.

When it comes to quality, trust EFD to leave nothing to chance.

Viscosity

Viscosity is the measurement of a fluid's internal resistance to flow. This is usually designated in units of centipoise or poise but can be expressed in other measurements as well. Some conversion factors are as follows:

100 Centipoise = 1 Poise
1 Centipoise = 1 mPa s (Millipascal Second)
1 Poise = 0.1 Pa s (Pascal Second)
Centipoise = Centistoke x Density

Approximate Viscosities of Common Materials
(at room temperature - 70°F/21°C)

Material	Viscosity in Centipoise
Water	1 cps
Milk	3 cps
SAE 10 Motor oil	85-140 cps
SAE 20 Motor oil	140-420 cps
SAE 30 Motor oil	420-650 cps
SAE 40 Motor oil	650-900 cps
Castor oil	1,000 cps
Karo syrup	5,000 cps
Honey	10,000 cps
Chocolate syrup	25,000 cps
Ketchup	50,000 cps
Mustard	70,000 cps
Sour cream	100,000 cps
Peanut butter	250,000 cps
Shortening	1,200,000 cps

Dispensing tip size chart

EFD's unique disposable stainless steel blunt end dispensing tips are used for all kinds of applications, with all kinds of assembly fluids. Below is a tip guide that lists the gauge sizes and the respective ID and OD sizes.

	ID size		OD size	
gauge	in	mm	in	mm
14	0.060	1.55	0.072	1.83
15	0.054	1.37	0.065	1.65
16	0.047	1.19	n/a	n/a
18	0.033	0.84	0.050	1.27
20	0.023	0.61	0.036	0.91
21	0.020	0.51	0.032	0.81
22	0.016	0.41	0.028	0.71
23	0.013	0.33	0.025	0.64
25	0.010	0.25	0.020	0.51
27	0.008	0.20	0.016	0.41
30	0.006	0.15	0.012	0.30
32	0.004	0.10	0.009	0.23

"For 12 years, I have purchased your equipment. What can I say? It works and works and works ... Keep up the great job!"

—Charles Bissot, AMP Inc.

Conversions

Volume

1 fluid ounce	= 29.57 cubic centimeters
1 gallon	= 3785 cubic centimeters
1 gallon	= 3.785 liters
1 gallon	= 128 fluid ounces
1 gallon	= 4 quarts
1 gallon	= 8 pints
1 gallon	= 16 cups
1 gallon	= 231 cubic inches
1 gallon	= 0.134 cubic feet
1 liter	= 0.264 gallons
1 liter	= 1.06 quarts
1 liter	= 1000 milliliters
1 cubic foot	= 1728 cubic inches
1 cubic foot	= 7.48 gallons
1 cubic inch	= 16.387 cubic centimeters
1 cubic centimeter	= 1 milliliter
1 microliter	= 0.001 cc's
1 microliter	= 1000 nanoliters
1 nanoliter	= 0.000001 cc's
1 nanoliter	= 1000 picoliters

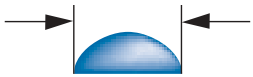
Weight

1 kilogram	= 1000 grams
1 kilogram	= 2.2 pounds
1 pound	= 16 ounces
1 pound	= 453.6 grams
1 pound	= 7000 grains
1 ounce	= 28.35 grams

Length

1 micron	= .0000394 inches
1 micron	= 0.001 millimeters
1 centimeter	= 10 millimeters
1 centimeter	= 10,000 microns
1 inch	= 2.54 centimeters
1 inch	= 25.4 millimeters
1 inch	= 25,400 microns
1 foot	= 30.48 centimeters
1 yard	= 91.44 centimeters
1 mile	= 5280 feet
1 mile	= 1.6 kilometers

Volume of dots and beads



Volume = D^3 x 0.5236 ÷ 2*

(* 1/2 the volume of a sphere)

Volume of dots

dot	inches	mm	V cc
·	0.020	0.51	0.00003
•	0.030	0.76	0.0001
•	0.040	1.02	0.0003
•	0.050	1.27	0.0005
•	0.070	1.78	0.001
•	0.090	2.29	0.003
•	0.110	2.79	0.006
•	0.130	3.30	0.009
•	0.150	3.81	0.014
•	0.170	4.31	0.021
•	0.190	4.83	0.029
•	0.220	5.59	0.046
•	0.240	6.09	0.059
•	0.260	6.60	0.075

Volume of dots

dot	inches	mm	V cc
•	0.300	7.62	0.116
•	0.350	8.89	0.184
•	0.400	10.16	0.275
•	0.450	11.43	0.391
•	0.500	12.70	0.536
•	0.750	19.05	1.810

Volume of beads

bead size (diameter - inches)	volume per linear inch cubic inch	cc's
0.0625	0.0031	0.050
0.0937	0.0069	0.113
0.125	0.0123	0.201
0.1875	0.0276	0.453
0.250	0.0491	0.805
0.3125	0.0767	1.257
0.375	0.1104	1.810
0.500	0.1964	3.218
0.625	0.3068	5.028
0.750	0.4418	7.242
1.000	0.7854	12.873

Solder paste alloys

Alloys	solidus (C°)	liquidus (C°)	tensile strength (psi)	shear strength (psi)
Sn42 Bi58	-E-	138	8000	500
Sn43 Pb43 Bi14	144	163	6120	na
Sn62 Pb36 Ag2	179	189	6700	6250
Sn63 Pb37	-E-	183	6700	6060
Sn60 Pb40	183	191	6200	5680
Sn96.5 Ag3.0 Cu0.5	215	217	na	na
Sn96.3 Ag3.7	-E-	221	8900	4600
Sn100	MP	232	1800	2560
Sn95 Sb5	232	240	5900	6200
Sn95 Ag5	221	245	10100	8400
Sn10 Pb88 Ag2	268	290	4900	4300
Sn5 Pb92.5 Ag2.5	287	296	4210	2240
Sn10 Pb90	275	302	4600	3900
Sn5 Pb95	308	312	4190	3000

-E-: Eutectic MP: Melting point Lead free

Solder powder sizes

powder type	size microns	mesh count	stencil aperture (inches)	dispense dot diameter (inches)
II	75-45µ	-200+325	≥0.012	≥0.030
MM	53-38µ	-270+400	≥0.009	≥0.024
III	45-25µ	-325+500	≥0.007	≥0.020
IV	38-25µ	-400+500	≥0.006	≥0.015
V	25-20µ	-500+635	≥0.004	≥0.010

Tip selection guide for solder paste dispensing

For best performance, we recommend our plastic tapered (TT) tips for smooth solder paste flow. When using our general purpose (GP) tips, choose the shortest tip available that meets your process requirement.

gauge	color	tip ID	minimum dot diameter	largest powder TT	largest powder GP
14	olive	0.060	0.090	II	II
15	amber	0.054	0.081	-	II
16	grey	0.047	0.071	II	-
18	green	0.033	0.050	II	II
20	pink	0.023	0.035	II	II
21	purple	0.020	0.030	-	II
22	blue	0.016	0.024	II	III*
23	orange	0.013	0.020	-*	III*
25	red	0.010	0.015	III*	IV*
27	clear	0.008	0.012	-*	IV*
30	lavender	0.006	0.009	-*	V*

*Intended for use with positive displacement valves

Worldwide markets—
one customer at a time.

Engineers in every manufacturing industry, in virtually every part of the world, depend on EFD equipment for repeatable, trouble-free performance.

From catheters in Ireland to mobile phones in Malaysia, from lightbulbs in Hungary to connectors in Puerto Rico, and from optoelectronics in Singapore to automobile parts in Brazil, EFD precision dispense systems are a critical part of today's global production.

Contact any of our offices around the world. We have an experienced, knowledgeable staff prepared to serve you.

Worldwide Regional Offices

www.efd-inc.com/contact.html

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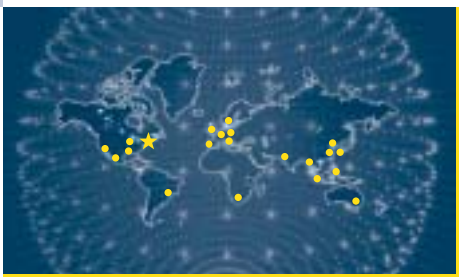

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