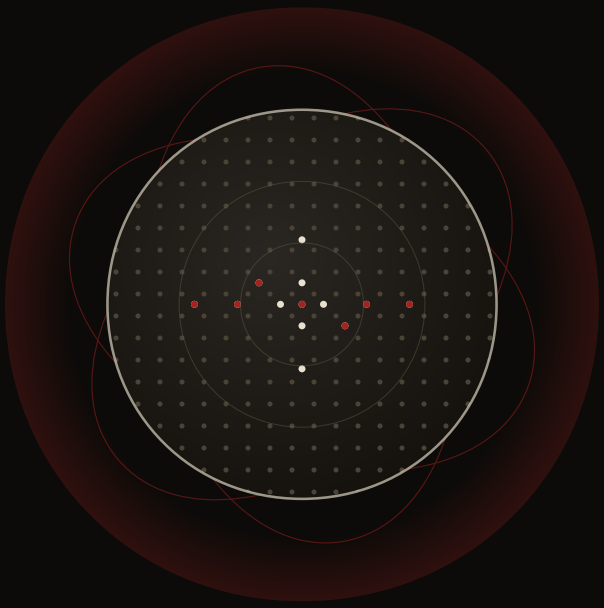
ACCESS TO CODED MAGNETS

THE WHOLE MAGNETICS CATALOG



Programmable · Coded · Multipole

A WORKING CATALOG

WHOLEMAGNETICS · FALL 2026

The Whole Magnetics Catalog

ACCESS TO CODED MAGNETS

Fall 2026 Edition

WHOLEMAGNETICS · THE HUB FOR THE FIELD

The Whole Magnetics Catalog
Fall 2026 Edition

Compiled and published by WholeMagnetics, the hub for the coded, programmable and multipole magnet field. In the spirit of Stewart Brand's *Whole Earth Catalog* (1968-1972).

ISBN 979-8-9900000-0-1

Provisional identifier — pending ISBN registration. Replace with the assigned ISBN before distribution or sale.

This catalog is a curated guide, not a store. Part numbers and prices are those published by their makers and distributors as of Fall 2026 and are subject to change. Strength and performance figures attributed to a vendor are that vendor's claims, not independent measurements; this book marks them as such. No independent third-party force test of a coded magnet has been published; the one verified field deployment is NASA's Prandtl-M glider.

Polymagnet is a registered trademark of Correlated Magnetics Research, Inc. All other marks belong to their owners.

First printing, 2026. Typeset from the live edition at wholemagnetics.com/wmc.

CONTENTS

I **Understanding the field** 5
the science, before the parts make sense

II **The eight behaviors** 9
the vocabulary of programmable force

III **Tools & demo kits** 13
you cannot argue with a magnet in your hand

IV **Working parts** 15
real datasheet parts, filed by what they do

V **Design & magnetizing** 17
how a pattern is written

VI **The trade** 19
a map of a fragmented market

VII **Learning & evidence** 21
what's shown, tested, and flown

VIII **The source** 23
where every road leads

IX **The wider field** 25
cool companies & products beyond coded magnets

X **The shelf** 29
apps to simulate it, books to understand it

Index 33
by term · the back of the book

UNDERSTANDING THE FIELD

THE IDEA, BEFORE THE PARTS MAKE SENSE

A coded magnet is not a stronger magnet — it is a magnet that has been *told what to do*. The behavior lives in the pattern, not the material. Six ideas carry the whole field; get these and every part in this catalog explains itself.

THE PREMISE

The coded magnet. A single piece of ordinary sintered neodymium whose face has been re-magnetized into a *designed* pattern of many small north and south regions, instead of one plain pole pair. Because the behavior is written into the arrangement, the same blank — same material, same size, same raw strength — can be made to grip, to push, to center itself, or to click. Correlated Magnetics Research trademarked the category as Polymagnet. *If you understand one entry in this book, make it this one; everything else is a consequence of it.* Access: the explainers at **codedmag.com** and **multipolemag.com**.

> *Strength is a property of the material; behaviour is a property of the pattern. If a part is not strong enough, change the material or the size. If it does the wrong thing, change the pattern.*
>
> MAXELMAG.COM

THE UNIT

The maxel. One "magnetic pixel" — a single poled region, roughly 1–4 mm across, written independently of its neighbors. A screen pixel is one addressable dot of color; a maxel is one addressable patch of polarity. A photograph isn't a brighter dot — it's many dots arranged. A coded magnet isn't a stronger magnet; it's many poles arranged. Access: **maxelmag.com**.

THE LAW

The exponential near field. For a patterned face the field falls off as $F \propto e^{-2\pi z/\lambda}$ — z the gap, λ the pole pitch. Tight patterns hit hard but die within a millimeter or two; coarse patterns reach a little farther, softer. Reach itself becomes a design knob — and the reason coded magnets are contact devices, not across-the-room magnets. Access: **multipolemagnets.com**.

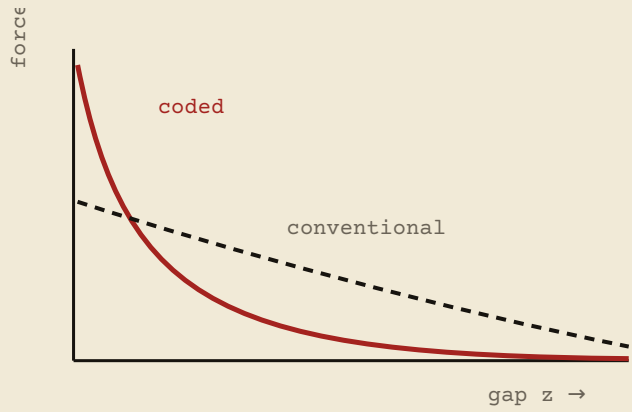


FIGURE 1 · NEAR-FIELD DECAY

Why a coded magnet is nearly dead an inch away

Each maxel's flux closes into its opposite-polarity neighbor a millimeter away, so the field piles up at the surface and collapses fast beyond it. Huge force at contact; almost nothing at a gap. That is the whole trade: behavior and holding strength at the surface, bought with reach.

Source: multipolemag.com/how-it-works. Curve illustrative of the stated law.

THE TRICK

The correlation idea. Fullerton's insight came straight from radar: a receiver finds a coded pulse train by *correlation* — perfectly aligned gives a huge spike, slightly off collapses to near-nothing. Do the same with poles (the patents literally use Barker codes) and at exact registration every north sits over a south and all pairs pull; nudge it and attract lands on repel, and the sum falls — the patent cites roughly *ten-fold* off-peak. Access: **multipolemag.com** — how it works.

THE HONEST PART

No new energy. Coding redistributes a field; it does not add force. It rides the material's fixed energy product (NdFeB tops out around 52 MGOe). Concentrate flux at the surface and you get more force at contact and less everywhere else. There is no free lunch — only a cleverly spent one.

Access: **multipolemag.com** — vs conventional.

THE LIMITS

What it can't do. Three honest walls. *Short reach* — essentially a contact device. *No levitation* — Earnshaw's theorem holds; every "magnetic spring" demo rides a pin or shaft. *Heat* — standard demo parts are rated to about 60 °C. For pull across a real gap, a plain dipole still wins. Access: **multipolemag.com**.

THE COUSIN

Halbach array. A rotating-orientation stack that pushes nearly all its flux to one face and cancels the other (Mallinson 1973, Halbach 1980s). It shares the steep near-field decay but is *periodic* — uniform one-sided flux for motors, MRI and maglev. Coded magnets are *aperiodic*, correlation-designed, and print an arbitrary force function into one piece. Access: **multipolemagnets.com**.

A conventional magnet is a bulk force. A coded magnet is a mechanism.

MULTIPOLEMAG.COM · THE ONE-LINE DIFFERENCE WORTH MEMORIZING

II
THE EIGHT BEHAVIORS

THE VOCABULARY OF PROGRAMMABLE FORCE

Correlated Magnetics names eight things a coded face can be told to do. Each is the same trick — a sculpted *spatial force function* — aimed at a different job. Learn these eight words and you can describe almost any coded part.

Attach Alternating poles grip hard at contact, resist sliding, almost no reach.	**Align** One agreeing position pulls to center or angle; pushes back everywhere else.	**Latch** Holds off at a distance, then latches firmly the instant it touches.	**Spring** Two frequencies float a pair at a set gap — a contactless spring.
Twist-release Holds when aligned; a small turn flips it to repel and eject.	**Shear** Striped poles resist sideways slip while seated, with no key.	**Torque** Transmits rotation face-to-face — the seed of a magnetic coupling.	**Detent** Sectors give discrete click positions (4, 6, 12…) like a dial.

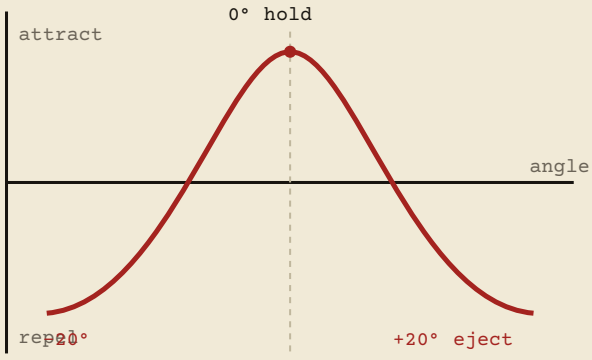


FIGURE 2 · TWIST-RELEASE, DATASHEET 1002300

Hold at zero, eject at a twist

The 1″ D-shaped N50 pair NASA's glider and the famous SmarterEveryDay video both show. *49 N (~11 lb) attracting at 0°; about 57 N (~12.8 lb) actively repelling at ±20°*, re-latch window near 4 mm. The force crosses through zero as you turn it.

Source: polymagnet datasheet 1002300.

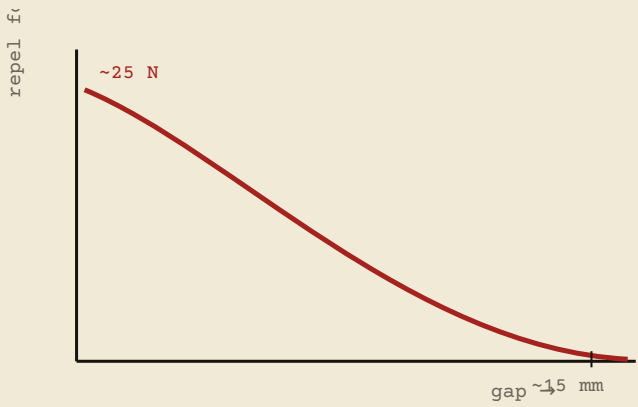


FIGURE 3 · SPRING / STANDOFF, DATASHEET 1002288

A spring with no coil

A coarse frequency attracts at range while a fine one repels up close, so the pair floats at a designed gap. *Peaks around 25 N near contact and fades to zero by about 15 mm.* Nothing to fatigue, corrode, or house — but it needs a pin for lateral constraint. Not levitation; Earnshaw still rules.

Source: polymagnet datasheet 1002288.

READ THE PATTERN

Pattern becomes behavior. A clean teaching set: alternating poles → attach; stripes → shear resistance; concentric rings → spring; a rotational code → align; sectors → detent; uniform → a plain hold. Same material, same size, same strength — change only how the maxels are arranged and you change what the part does. Access: the pattern gallery at **maxelmag.com/patterns**.

LOCK & KEY

Coded identity. Because autocorrelation makes a matched, aligned pair strong and everything else collapse, a pattern becomes an identity: a connector that refuses the wrong socket, an anti-counterfeit seat, a mechanical lock-and-key. Patented in coded filter interconnects that seat only when correct. Rejection is analog — strongly weaker, not literally zero. Access: **multipolemag.com** — behaviors.

III TOOLS & DEMO KITS

YOU CANNOT ARGUE WITH A MAGNET IN YOUR HAND

The whole technology is counter-intuitive until you feel it, and then it is obvious. These are the kits that let you feel align, latch, spring and hold for yourself — the cheapest education in the field, and the thing to put in a skeptic's hand. Prices as listed by FerroSpring, a beta-test Polymagnet distributor.

START HERE · $149

Polymagnet Demo Kit. The complete hands-on introduction — feel align, latch, spring and hold in one box. This is the conversion tool: the ten seconds that do what a page of force curves can't. *If you buy one thing in this catalog, buy this.* Access: **ferrospring.com** · part 1002031.

ONE BEHAVIOR EACH · $16–$52

Behavior demos. Knob-mounted single-behavior magnets, each tuned to show one thing cleanly: Controlled Field and High-Force (~$21 each), a plain-magnet baseline (~$16), Rotational Alignment (~$42), and Twist-Release, Latch, Spring-Latch and Spring (~$52 each). Buy the one that matches your argument. Access: **ferrospring.com**.

SEE THE POLES · $16 / $91

Magnetic viewing film. A thin sheet of oil-suspended particles that turns an invisible pattern into visible light and dark. The standard way to confirm a part is coded, that it matches the design, and that it's centered. *A magnetic field has no appearance; viewing film gives it one.* No power, no calibration. 100×75 mm or 200×300 mm. Access: **ferrospring.com**.

THE LAB BENCH · $3.50–$24.50

Steel plate & brass rod. Two cheap accessories that turn a demo into a lab: a zinc-coated steel test plate (~$24.50) to feel holding and release on a real surface, and a non-magnetic brass constraining rod (~$3.50) that brings a pair together so you feel each behavior exactly as designed. Access: **ferrospring.com**.

IV
WORKING PARTS

REAL DATASHEET PARTS, FILED BY WHAT THEY DO

Purchasable parts, grouped by behavior rather than material, with datasheet part numbers so you can find them at the source. Function pairs run roughly *$10–$40* against under $2 for a plain magnet — you pay for the behavior, not the neodymium. No mechanism, no hinge, no spring to wear.

1002300 · ~$35

Twist-release pair. The signature part: 1″ D-shaped N50 pair, *49 N hold at 0°, ~57 N eject at ±20°*, re-latch near 4 mm. The mechanism NASA flew and the one the famous video shows. Access: **polymagnet.com** — datasheet 1002300.

1002288

Spring & spring-latch. The contactless standoff — two spatial frequencies in one face, *~25 N near contact fading to zero by ~15 mm*. Its sibling is "two devices in one part": a spring at 0°, a clamp at 180°. Runs on a pin for lateral constraint. Access: **polymagnet.com** — datasheet 1002288.

LICENSED LINE

Max-Attach high-hold. The high-holding family, licensed to Industrial Magnetics Inc.: *28 sizes, 8–96 lb holding*. Fine patterns concentrate flux at the surface — especially effective on thin steel, where a plain magnet's deep field leaks out the far side. Strength multipliers ("2× pull, 2–8× shear") are *vendor figures*. Access: **multipolemag.com** · Industrial Magnetics (magnetics.com).

CLICK STOPS · $28–$44

Rotational detents. 4-position (90°, ~$28) and 12-position (30°, ~$37) D-shape pairs, plus a 2″ drawer detent (~$44). The feel of a well-made dial, with nothing mechanical inside to wear out. Access: **ferrospring.com**.

THE WORKHORSE · $18–$40

Alignment pairs. Center-alignment and bi-directional pairs, long- and short-range, in #4/#6/M4 countersunk mounts (0.63″–1″) so they bolt straight into an assembly. The most-used family in the catalog — the parts that quietly make two things meet correctly. Access: **ferrospring.com** · **polymagnet.com**.

SNAPS & CLOSURES · $22–$48

Latches & device mounts. Push-to-close ring latches (~$25), sliding spring-latches for laptop and tablet closures (~$22), and portrait/landscape device mounts for phones and tablets that snap and lock at each rotation (~$29–$48). The consumer-facing edge of the technology. Access: **ferrospring.com**.

V
DESIGN & MAGNETIZING

THE MEANS OF PRODUCTION

A coded magnet is really software plus a magnetizing fixture. Whoever owns the fixture owns the part. This is the step where "a magnet that behaves" becomes a repeatable part on a drawing — and the step where, by Correlated Magnetics' own account, *magnetization became software*.

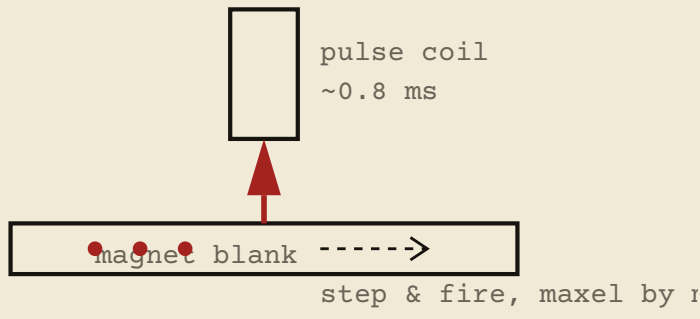


FIGURE 4 · THE MAGPRINTER, 2013

A dot-matrix printer for magnetism

A computer-controlled magnetizing head writes a pattern one pixel at a time, from a file. A capacitor bank fires a pulse of about *0.8 ms* through a coil focused by a roughly *1 mm aperture*, setting one maxel; the stage steps and fires again. A full pattern takes seconds to minutes.

Source: maxelmag.com/printing; writing patents US 10,204,727 et al.

THE REVOLUTION

Magnetization became software. Change the design and you change a file — not tooling, not casting, not a new sinter run. The same blank becomes a latch, a spring, or a key. *The magnet equivalent of moving from cast metal type to the laser printer.* Prototype in minutes or hours, not months. Access: **multipolemag.com** — manufacturing.

DESIGN IT

Polyvision software. Place maxels on screen, watch the force-versus-distance curve in real time, iterate, then order the custom part that results — the same tools behind every Polymagnet. The practical bridge from "a magnet that behaves" to a manufacturable part. Access: **polymagnet.com** — design tools.

THE GATEKEEPER

Magnetizing fixtures. The fixture — a tooled coil — defines the pattern; a capacitor-discharge pulse magnetizer supplies the energy. High-coercivity material holds a pattern beautifully, the same property that makes it need a stronger pulse to write. Own one and you can code; without it you're a customer. Access: the equipment houses in Section VI.

RIDES THE CHAIN

Substrate independence. The input is ordinary magnet stock — sintered NdFeB, SmCo for heat and corrosion, flexible sheet, or ferrite. Programmable magnetization is a *value-add process, not a new material*; it rides the existing supply chain, and the coding step is not in the China-dominated part of it. Access: **multipolemag.com** — manufacturing.

THE CRUDE ALTERNATIVE

vs fixturing. The competing way to make a multipole magnet is *fixturing* — an array of electromagnets fired to write fields into a blank. It works for crude patterns (half north, half south) but can't place features close together or make really small ones. Precise, computer-controlled printing is what separates an *advanced* multipole magnet from one a fixture could stamp out. Access: **multipolemag.com** — vs conventional.

VI
THE TRADE

A MAP OF AN UNUSUALLY FRAGMENTED MARKET

From a single inventor, out to the makers, out again to the rare-earth mines. It is a scattered field, which is exactly why it wants a map. *It is also the field a consolidator would want a map of.* Named here only where the sources name them.

THE CENTER

CMR & Industrial Magnetics. Correlated Magnetics Research (Huntsville, AL) is the inventor and IP holder — licensing, custom design-ins, Polyvision, magnetizers, demo kits. Its verified manufacturing and applications partner is *Industrial Magnetics Inc.*, which builds the licensed Max-Attach / Smart-Mag assemblies. Access: **polymagnet.com** · magnetics.com.

THE FIELD

Other coded makers. The real competitive set: *MPCO Magnetics* (US), *SDM Magnetics* (China, now offering patterned magnetization — the named threat), and *EPI Magnets* (China, Halbach arrays and couplings). Adjacent "programmable without coding": *Magswitch* (switchable magnets, 65+ patents) and *Magnomatics* (magnetic gears). Access: **wholemagnetics.com/field/makers**.

WHO MAKES THE PRINTERS

Magnetizing equipment. The upstream that writes the patterns: *Magnet-Physik Dr. Steingroever* (Germany), *Laboratorio Elettrofisico* (Italy), *Dr. Brockhaus Messtechnik* (Germany), and *Metis Instruments* (Belgium) — pulse magnetizers, fixtures, and the test gear that proves a pattern is right. Access: **wholemagnetics.com/field/suppliers**.

CHECK YOUR FACTS

Standards & the default suppliers. Where the field keeps itself honest: the *IEEE Magnetics Society* (Transactions, INTERMAG, MMM), the *International Magnetics Association*, and *Magnetics Magazine*. For plain neodymium and education, *K&J Magnetics* is the default retailer — and ran the one near-independent test in this book. Access: **wholemagnetics.com/field/standards**.

VII
LEARNING & EVIDENCE

WHAT'S SHOWN, TESTED, AND FLOWN

This is a young field with more demonstration than independent data, and this catalog says so. Here is the on-ramp — and, just as important, an honest account of what has actually been measured and deployed versus what is still a vendor's word.

THE FAMOUS ONE

SmarterEveryDay #153. "Mind-Blowing Magic Magnets" (2015), filmed at Correlated Magnetics, is the video that introduced coded magnets to millions — and it shows the exact twist-release behavior in Section II. The best five minutes of on-ramp there is. Access: the vetted shelf at **whole-magnetics.com/videos**.

THE ONLY TEST

The K&J pull test. The one near-independent datapoint in the whole category: K&J Magnetics built arrays from the same five cubes and pull-tested them on steel. The alternating-pole array *out-pulled both a plain stack and a Halbach — 88 lb vs 72–77 lb*. Directional support for the surface-concentration claim, at contact, on steel. Access: K&J Magnetics blog, via **multipolemag.com**.

THE ONE DEPLOYMENT

NASA Prandtl-M. NASA Armstrong flew a Polymagnet twist-release on its Prandtl-M glider — *five successful flight releases* (Dec 2021, Sept 2022). The category's single fully primary-source-verified deployment. When a big-name claim in this field is in doubt, ask for the equivalent of this article. Access: **multipolemag.com** — applications.

THE RECORD

The patent library. The citable technical spine: *US 7,800,471* (the 2008 cornerstone — correlated field emission, the ~10× off-peak collapse), the force-profile and coding patents that follow, *US 10,204,727* (MagPrinter writing), and the coded-interconnect patents. The earliest expire around 2028–2030 — a date that could open the field to second sources. Access: **multipolemag.com** — sources.

No independent third-party force test of a coded part has ever been published. Only NASA's glider is a verified deployment. Everything stronger than that is a vendor's word — so we label it.

THE HONESTY NOTE THIS CATALOG KEEPS

VIII
THE SOURCE

WHERE EVERY ROAD LEADS

Every road in this catalog leads back to one company and one man. Not a marketing claim — a matter of record.

We are as gods and might as well get good at it.

STEWART BRAND · THE WHOLE EARTH CATALOG, 1968

THE COMPANY

Polymagnet. Correlated Magnetics Research — founded in North Alabama in 2006 as Cedar Ridge Research, renamed in 2008, and still independent in Huntsville — invented and patented the coded magnet. It holds the maxel-printing technology behind this entire catalog and makes the reference parts, the design software and the demos. *If you buy one thing after reading this catalog, buy it from the people who made the field.* Access: **polymagnet.com** — Huntsville, AL.

1950–2016

Larry Fullerton, inventor. An ultra-wideband radio pioneer who conceived UWB in 1973 and held, by report, 500-plus patents. The magnet idea reportedly began with wanting a *self-assembling toy for his grandchildren* — parts that would find their own way together — and his radar instinct supplied the mechanism: encode the faces like a coded pulse train and let correlation do the assembling. Co-invented with Mark Roberts. Popular Mechanics Breakthrough Award, 2010. Access: **multipolemag.com** — company & history.

IX
THE WIDER FIELD

COOL COMPANIES & PRODUCTS BEYOND CODED MAGNETS

Coded magnets are one bright corner of a very large field. These are companies and products from the rest of it worth knowing — some adjacent to programmable magnetism, some just gloriously clever uses of a magnet. Our own selection; facts sourced to each maker.

RARE-EARTH-FREE

Niron Magnetics. The most interesting thing happening in magnet *materials*: a permanent magnet built from iron nitride ($Fe_{16}N_2$) instead of neodymium — the "Clean Earth Magnet," by many accounts the first genuinely new permanent-magnet material in about forty years, with no rare earths and no China-controlled supply chain. Spun out of the University of Minnesota in 2014; backed by GM, Stellantis and Samsung Ventures; a Minnesota plant is targeting roughly 1,500 tons a year by 2027. *Coding rides whatever magnet stock exists — a rare-earth-free substrate would change the story underneath this catalog.* Access: **nironmagnetics.com**.

NO GAS, NO COMPRESSOR

Cooling with magnets. Refrigeration with no refrigerant: a magnetic field cycles a magnetocaloric material instead of compressing a gas. *Magnotherm* (Germany) won Refrigeration Innovation of the Year at ATMO Europe 2025; *Magnoric* (France) builds magnetocaloric display cabinets; *Kiutra* uses adiabatic demagnetization to reach sub-kelvin, cryogen-free, for quantum computers; *Camfridge* (UK) has worked it since 2005. Access: **magnotherm.com** · **magnoric.com**.

ZERO CONTACT

Active magnetic bearings. A shaft that spins on a controlled magnetic field, touching nothing — no lubrication, no wear, very high speed. *SKF* (through its S2M / Revolve line) builds the electromagnets and control that hold a rotor in mid-air inside turbomachinery and compressors. Access: **skf.com** — magnetic bearings.

MULTIPOLE, AT VOLUME

Encoder rings. The most-made multipole product on earth, and nobody notices it: a ring magnetized with many alternating N/S pole pairs (down to ~2 mm pitch), read to measure angle or speed. *Phoenix America* (US) makes the patterned ring targets; *Baumer* builds bearingless encoders that read them across big air gaps, on shafts up to about three meters. Access: **phoenixamerica.com** · **baumer.com**.

SNAP-TOGETHER POWER

Self-mating connectors. Magnets as the connector itself. *Rosenberger's MagCode* is a short-circuit-proof, self-finding 12/24 V power coupling that just snaps on; its *Magnetic RJ45* carries data and power-over-Ethernet in one magnetic click — no fumbling, no wrong insertion, no bent pins. Access: **rosenberger.com** — MagCode.

LEVITATION YOU CAN BUY

Flyte & Quantum Levitation. *Flyte* is an Edison-style bulb that hovers on magnetic levitation and lights wirelessly through the air — one of TIME's Best Inventions of 2016. *Quantum Levitation* sells a desktop kit where a cooled superconductor flux-pins over a magnet track and locks in place, even upside-down. (The Hendo and Lexus hoverboards were real proofs of concept, never sold.) Access: **flyte.se** · **quantumlevitation.com**.

THE MAGNETIC LIQUID

Ferrofluid. *Ferrotec* commercialized ferrofluid — a liquid that responds to a magnetic field — now used in loudspeakers, sensors, and the vacuum rotary seals that keep chip-fab chambers clean. It is also the stuff of the hypnotic sound-reactive ferrofluid sculptures that spike and dance under driven electromagnets. Access: **ferrotec.com**.

THE FIRST TOY

Geomag & Speks. Where a lot of engineers actually started. *Geomag* (Switzerland, 1998) is credited as the first magnetic construction toy — neodymium-tipped rods and steel spheres. *Speks* are rare-earth desk sets that behave like putty, stress-ball and building block at once. The cheapest intuition for "force you can arrange" there is. Access: **geomagworld.com** · **getspeks.com**.

INDUSTRIAL MUSCLE

Separation houses. The unglamorous giants that keep tramp metal out of your food and pull non-ferrous metal from scrap with eddy-current separators: *Bunting* (US/UK, since 1959, which absorbed Master Magnets), *Goudsmit* (Netherlands), and *Eclipse* (UK). Magnetism doing a billion quiet tons of work a year. Access: **buntingmagnetics.com** · **goudsmitmagnets.com**.

X
THE SHELF

APPS TO SIMULATE IT, BOOKS TO UNDERSTAND IT

When the demo and the parts aren't enough: the software to see a field before you commit it, and the books that explain the whole of magnetism — multipole patterns and everything around them. Where a tool can handle *multipole* or Halbach arrays, we say so.

First simulate the field. Then write it into the magnet.

THE ORDER OF OPERATIONS, FOR ANYONE DESIGNING A CODED PART

FREE · SOFTWARE

FEMM. Finite Element Method Magnetics — the free, open-source workhorse for 2D and axisymmetric magnetostatics (David Meeker). Lua scripting and ActiveX automation drive it from MATLAB or Octave. Multipole within its 2D limits; no full 3D. The first solver most people learn. Access: **femm.info**.

FREE · PYTHON · MULTIPOLE

Magpylib. An open-source Python library that computes magnetic fields analytically — fast, vectorized, and explicitly documented for building *Halbach arrays and arbitrary magnet assemblies*. The best free route to a multipole field on your own laptop, scriptable into any design loop. Access: **github.com/magpylib/magpylib**.

FREE · 3D · MULTIPOLE

Radia. A 3D magnetostatics code from the synchrotron world, built for open-boundary problems with large air gaps — no air meshing. Made for *undulators, wigglers, Halbach arrays and multipole accelerator magnets*, which makes it unusually well-suited to patterned permanent-magnet structures. Access: **github.com/ochubar/Radia** (ESRF).

COMMERCIAL · FEA

Maxwell, COMSOL, Simcenter MAGNET. The industry 2D/3D electromagnetic FEA tools: *ANSYS Maxwell*, *COMSOL* (AC/DC Module, coupled to thermal and structural), and *Siemens Simcenter MAGNET* (formerly Infolytica). All take arbitrary 3D magnetization — motors, actuators, Halbach and multipole — at a real licensing cost. Access: **ansys.com** · **comsol.com**.

FREE STUDENT + PAID

QuickField. FEA for magnetic, electric, thermal and stress problems with coupling (Tera Analysis). The Student Edition is full-featured but mesh-capped — plenty for learning and small 2D or axisymmetric multipole studies before the professional tiers. Access: **quickfield.com**.

FREE · WEB

K&J calculators. K&J Magnetics' free browser calculators for pull force, field, gap and unit conversion — grounded in their own test data, not just theory. Single-magnet geometry (not multipole), but the fastest sanity check on "will this hold?" before you simulate anything. Access: **kjmagnetics.com** — calculators.

The books below range from one bedside read to the references on an engineer's shelf. The ones that actually treat patterned and multipole fields are marked.

ON READING ABOUT MAGNETISM

BOOK · POPULAR

Driving Force: The Natural Magic of Magnets. The classic, genuinely readable history-and-science of magnets — lodestones to maglev to MRI, with the economics and culture woven in. If you read one book here for pleasure, read this one. James D. Livingston · Harvard University Press, 1996.

BOOK · POPULAR

Magnetism: A Very Short Introduction. A crisp, 140-page tour from Galvani and Faraday through Maxwell, relativity, and magnetism's role in modern computing and storage. The fastest honest grounding before the heavier texts. Stephen J. Blundell · Oxford University Press, 2012.

REFERENCE · MULTIPOLE

Magnetism & Magnetic Materials. Coey's book is the modern standard graduate text — theory plus the practical reference data an engineer needs, strong on permanent-magnet field structures. Pair with *Permanent Magnetism* (Skomski & Coey, 1999). J. M. D. Coey · Cambridge University Press, 2010.

REFERENCE · MULTIPOLE

Permanent Magnet & Electromechanical Devices. Furlani's engineering text: magnetostatic analysis with sixty-plus worked examples, explicitly covering the design of rare-earth permanent-magnet structures — one of the few references that will help you shape a patterned field into a part. Edward P. Furlani · Academic Press, 2001.

REFERENCE · MULTIPOLE

Iron-Dominated Electromagnets. Tanabe's is the practical bible of *multipole* magnet design — dipoles, quadrupoles and sextupoles for particle accelerators. If your interest in "many poles, arranged" runs to beamline hardware, this is the one. Companion: Clarke's *Undulators and Wigglers* (Oxford, 2004). Jack T. Tanabe · World Scientific, 2005.

REFERENCE · CLASSIC

Introduction to Magnetic Materials. Cullity & Graham's long-standing teaching reference on magnetic quantities, measurement, and materials. Materials-and-fundamentals focus rather than patterned design, but the book most courses are built on. The deep reference is the Coey & Parkin *Handbook* (Springer, 2021). B. D. Cullity & C. D. Graham · Wiley-IEEE, 2008.

INDEX

Terms, parts, people and makers, each with the page where it is discussed.

A-C

Align (behavior) 9
Alignment pairs 15
Attach (behavior) 9
Barker code 5
Behaviors, the eight 9
Coded magnet 5
Correlated Magnetics Research 23
Correlation trick 5

D-H

Demo Kit (1002031) 13
Detents, rotational 15
Device mounts 15
Earnshaw's theorem 5
Exponential near field 5
FerroSpring 13
Fullerton, Larry 23
Halbach array 5

I-M

Industrial Magnetics 19
K&J pull test 21
Latch (behavior) 9
MagPrinter 17
Magnetizing fixture 17
Max-Attach 15
Maxel 5

N-S

NASA Prandtl-M 21
Near field vs far field . . . 5
Patents 21
Polymagnet 23
Polyvision software 17
Roberts, Mark 23
SmarterEveryDay #153 21
Spring / standoff (1002288) . 15

T-Z

Substrate independence 17
Torque (behavior) 9
Twist-release (behavior) . . . 9
Twist-release pair (1002300) . 15
Viewing film 13
Vendor claims (labeled) . . . 21

makers

EPI Magnets 19
K&J Magnetics 19
Laboratorio Elettrofisico . . 19
Magnet-Physik 19
Magnomatics 19
Magswitch 19
Metis Instruments 19
MPCO Magnetics 19
SDM Magnetics 19

wider field

Baumer (encoders) 25
Bunting / Goudsmit. 25
Encoder rings 25
Ferrofluid / Ferrotec 25
Flyte (levitation). 25
Geomag / Speks. 25
Magnetic bearings (SKF) . . . 25
Magnetocaloric cooling. . . . 25
Niron Magnetics 25
Phoenix America 25
Rosenberger MagCode 25

apps & books

ANSYS Maxwell 29
COMSOL. 29
Coey (textbook) 29
Driving Force 29
FEMM. 29
Furlani 29
K&J calculators 29
Magpylib. 29
QuickField. 29
Radia 29
Tanabe (multipole). 29

Draw the force before you make it.

The Whole Magnetics Catalog is a working map of the coded, programmable and multipole magnet universe — compiled and kept current by WholeMagnetics, the hub for the field. In the spirit of Stewart Brand's Whole Earth Catalog, 1968–1972: access to tools, turned toward a force you can finally program.

WholeMagnetics · Fall 2026 · ISBN 979-8-9900000-0-1 (provisional)