

Filtronic

FY23 results

Reaching for the stars

Filtronic is focused on market niches where its specialist expertise in designing and manufacturing high-performance radio frequency (RF) components and subsystems operating at frequencies up to 180GHz can command a premium. Management's strategic priority is to broaden the customer base and product range and optimise the utilisation of its RF manufacturing capacity. Factoring in improved component availability and recent contract wins, we forecast a return to revenue and EBITDA growth in FY24 followed by double-digit growth in FY25.

Year end	Revenue (£m)	EBITDA (£m)	PBT* (£m)	EPS* (p)	DPS (p)	P/E (x)
05/22	17.1	2.8	1.5	0.53	0	29.0
05/23	16.3	1.3	0.1	0.06	0	239.3
05/24e	20.7	2.2	0.7	0.32	0	48.4
05/25e	22.7	2.7	1.2	0.56	0	27.9

Note: *PBT and EPS (fully diluted) are normalised, excluding amortisation of acquired intangibles, exceptional items and share-based payments.

Innovation in RF technology

Filtronic is unusual in being one of only a few independent companies globally that has MMIC design engineers, RF hardware designers, RF manufacturing engineers and RF system engineers. It is also one of the few companies in Europe that has the equipment required to manufacture high-frequency RF subsystems in volume. Since this combination is rare, even large telecoms groups outsource design and manufacture of the critical RF front-end section of 5G and public safety communications networks to Filtronic. Similarly, large defence groups outsource the design and manufacture of the RF transmit and receive modules for radar.

Diversifying the customer base

Demand for Filtronic's products in its four strategic markets is benefiting from the 5G network roll-out worldwide, an emphasis in UK defence spending on developing a more sophisticated threat response, growing satellite-based internet connectivity and investment in US public safety networks to safeguard citizens. Management is also diversifying into new markets that will improve capacity utilisation, potentially increasing EBITDA margin in the longer term and reducing the company's dependence on three key customers. The company has begun to deploy its transceiver modules in new applications, including 5G test equipment, private low-latency links and quantum computing.

Valuation: Uplift for successful diversification

The stock is up 15% year-to-date, as recent contract wins in the low Earth orbit (LEO) satellite market and contract wins for low-latency private networks demonstrate that management's diversification strategy is going well. Our DCF analysis shows that if this strategy delivers 10% revenue growth each year between FY26 and FY28, coupled with year-on-year cost growth of just 4% over the same period, the indicative value per share would be 17p/share, 10% higher than the current level.

Tech hardware and equipment

4 August 2023

Price **15.5p**
Market cap **£33m**

Net cash (£m) at end FY23 (including £2.3m lease liabilities) 0.3

Shares in issue 215.1m

Free float 66.1%

Code FTC

Primary exchange AIM

Secondary exchange N/A

Share price performance



%	1m	3m	12m
Abs	0.0	31.9	9.5
Rel (local)	(0.3)	36.2	9.6
52-week high/low		18.0p	10.8p

Business description

Filtronic is a designer and manufacturer of advanced radio frequency communications products supplying a number of market sectors including mobile telecommunications infrastructure, public safety, defence and aerospace.

Next event

AGM 26 October

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**Filtronic is a research client of
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Investment summary

Company description: Innovation in RF technology

Filtronic's primary products are tower top amplifiers used in public safety communications networks and high-frequency transceivers (transmitter/receivers) for use in mobile telecommunications backhaul links, active electronically scanned array radars and emerging applications such as LEO satellite communications networks, low-latency networks, 5G test equipment and quantum computing.

Financials: Recovery in FY24 following component shortages

The shortage in certain semiconductor components hampered sales in H223, resulting in a 5% revenue decline for FY23. Margins were adversely affected by an unfavourable product mix with a higher proportion of mobile telecommunications transceivers. In addition, indirect costs were higher because of investment in sales channels and engineering in support of the company's diversification strategy resulting in a £1.5m decline in EBITDA to £1.3m (7.8% margin). Net cash including property leases fell by £1.6m to £1.6m at year-end. We forecast a strong rebound in revenue in FY24 due to delayed shipments from FY23 and the execution of recent contract wins and forecast 10% growth in FY25. We expect an increased weighting to lower margin product sales in FY24 and continued investment in indirect sales, resulting in EBITDA of £2.2m for the year (10.7% margin) growing to £2.7m in FY25 (12.0% margin). Increased depreciation and amortisation forecasts in FY24 reduce our diluted normalised EPS forecast by 22% (394% y-o-y growth). We forecast EPS growth of 73% in FY25.

Valuation: Successful diversification to drive share price uplift

Given the lack of direct peers and the volatility in the EBITDA margin, we prefer a discounted cash flow (DCF) approach for valuing Filtronic. This models the impact on EBITDA and the indicative valuation if diversification into new markets such as satellite communications enables Filtronic to deliver sustained double-digit revenue growth between FY25 and FY28, in line with management's objectives, while at the same time the indirect cost base stays close to FY25 levels. Our DCF analysis shows that if management achieves these objectives, further uplift in Filtronic's share price can be justified. Realising these objectives will depend on tight management of costs.

Sensitivities: Reducing customer concentration is key

We believe the key sensitivities are: (1) customer concentration: Filtronic is extremely dependent on its relationship with three key customers, which collectively accounted for 73% of FY23 revenues; (2) the speed of 5G roll-out outside China; (3) component availability, which caused some product deliveries to be delayed from H223 into FY24; (4) the war in Ukraine: Filtronic has not been directly affected by the war and is likely to benefit in the longer term if the war results in NATO members increasing expenditure on major equipment; and (5) recruitment: Filtronic is very dependent on the availability of engineers with master's degrees or doctorates in RF engineering. There are very few universities offering this training.

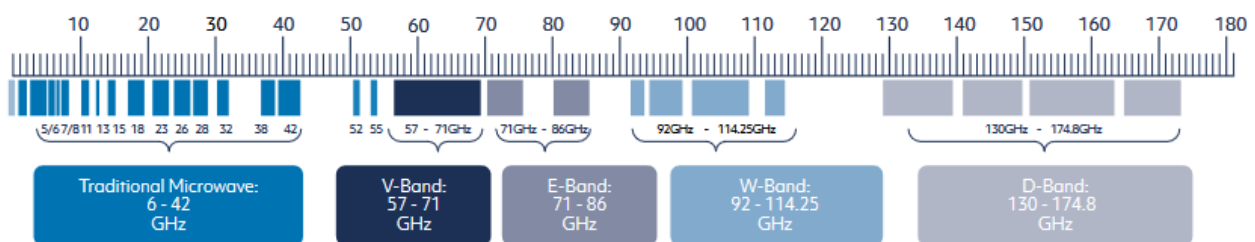
High-performance RF components and subsystems for demanding applications

Filtronic specialises in the design and manufacture of high-performance microwave communications components and subsystems operating at frequencies up to 180GHz. It is focused on market niches where this expertise can command a premium. Historically, its three main areas of activity have been mobile telecommunications infrastructure, defence and aerospace, and public safety, where equipment has to withstand harsh operating environments and meet demanding specifications.

Management's strategic priority is to broaden the customer base and product range to optimise the utilisation of its RF manufacturing capacity, thus improving the operating margin by delivering higher revenues from the same cost base. Potential revenue growth is being achieved by broadening the customer base and product range. While it continues to serve its customers in its three established markets, and has secured additional defence customers, the company is deploying its transceiver modules in new applications including high-altitude platform stations (HAPS) and LEO satellite communications, low latency banking networks, 5G test equipment and quantum computing.

Filtronic is well-placed to service both these established sectors and the newer ones because it has monolithic microwave integrated circuit (MMIC) design engineers, RF hardware designers, RF manufacturing engineers and RF system engineers. This combination of skills is rare outside large telecoms groups such as Ericsson, Huawei or Nokia, and even they often outsource RF front-end design because of a shortage of suitably experienced staff. Following more than £1m investment in equipment during FY20, Filtronic is also one of only a handful of companies in Europe that has the chip and wire bonding equipment required to manufacture high-frequency RF subsystems in volume. This range of skills means defence and telecoms OEMs, which are increasingly operating as system integrators to give more flexibility over their cost bases, can outsource both the design and manufacture of subsystems to a single supplier. Filtronic has over 80 patents (granted and pending) across its product portfolio.

Exhibit 1: Frequency table – traditional microwave to D-band



Source: Filtronic

The group is headquartered in Country Durham, UK, which is where sales, transceiver and transceiver module manufacturing, microwave and mmWave (30–300GHz) engineering are based. It also has a facility in Leeds, UK, where the engineering and development of filters, tower top amplifiers (TTAs) and associated RF systems and sub-systems for defence takes place; a facility in Manchester, UK, which adds to its engineering design capacity for mmWave products; and a facility in Maryland, US, where North American sales and the service, repair and manufacturing of critical communications products are located. The group employs around 130 people in total.

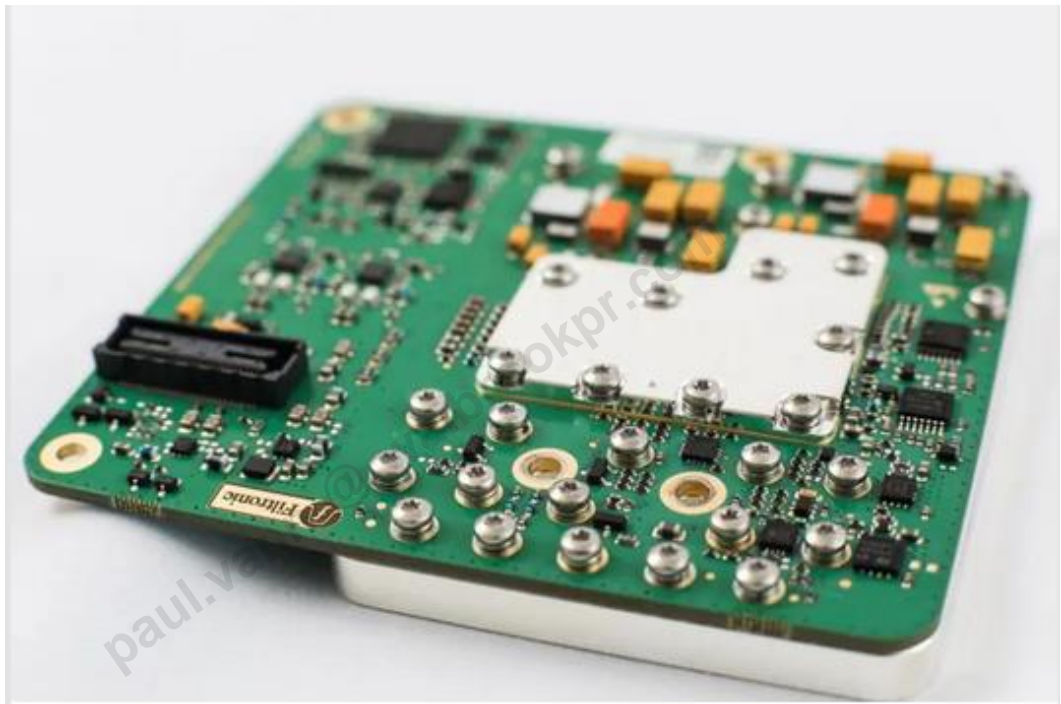
Communications for demanding environments

Historically, Filtronic's three main areas of activity have been mobile telecommunications infrastructure, defence and aerospace, and public safety. As part of its diversification strategy, the company is deploying its transceiver modules in new applications, of which the space sector currently presents the biggest opportunity so is discussed in more detail.

Mobile telecommunications infrastructure market

Enabling true 5G networks

Exhibit 2: Morpheus transceiver module



Source: Filtronic

Mobile phone cell sites are connected to the fibre backbone using either fibre links or wireless backhaul links. Initially the wireless links operated in the licensed microwave bands between 6GHz and 42GHz (see Exhibit 1). As the data demands on telecommunication networks have risen, the capacity provided by backhaul links has had to increase as well. This has been achieved by using links operating at higher frequencies so more data can be transmitted per second, most recently by using significant extra bandwidth in the lightly licensed E-band (71–76GHz/81–86GHz).

Filtronic has been designing and manufacturing E-band transceivers, devices that both transmit and receive wireless signals, for over a decade. The latest family, the Morpheus range, was launched in February 2020 and deploys a new generation of higher-power amplifier MMICs designed in-house by Filtronic. This gives Filtronic an immediate power advantage over amplifiers produced by competitors, which rely on standard MMICs from chip vendors. The first modules in the range, Morpheus II, were 20% smaller and 50% lighter than the Orpheus modules, which were launched in 2016. Both generations of modules are designed for easy integration into OEMs' outdoor units (ODUs), giving OEMs the advantage of a rapid time to market while requiring minimal engineering resource. Additionally, both the Orpheus and Morpheus modules have been qualified for deployment in the latest radio platforms specifically developed for 5G applications and have been field proven in wide-bandwidth, high-capacity applications up to 10Gbp per channel. Filtronic's lead

telecoms OEM customer, which had been deploying Orpheus modules in its 5G backhaul equipment, started to deploy Morpheus modules in volume during H121. In September 2022, the company launched the Morpheus X2 module, offering 3dB extra linear transmit power output compared to Morpheus II for the same footprint, increasing the line of sight of the ODU by up to 12km. In April 2023, the company signed a \$1.1m/£0.9m production contract with a leading 5G telecom infrastructure provider to supply Morpheus X2 modules through the course of FY24, with further production volumes forecast for FY25.

Early 5G networks augmented the capacity of existing 4G long-term evolution (LTE) networks through the use of carrier aggregation techniques, which enabled the basic 5G New Radio (5G NR) phase 1 performance requirements to be met. More recent network rollouts deliver the full 5G NR phase 2 performance. These networks require higher transmission capacities, which can only be achieved by moving to the higher frequencies. The shift to full high-performance E-band is therefore beneficial to Filtronic, which is able to offer equipment at this frequency. For example, demand was boosted recently by network providers building inventory to support the construction of networks in India following the regulatory authority there finally approving the release of E-band and V-band licences in August 2022. The shift to E-band is also beneficial because more cell sites are needed to provide the same coverage in a network because higher-frequency wireless links cover shorter distances.

Filtronic is already preparing for a move into even higher frequency bands: W-Band (92–114.5GHz) and D-Band (130–175GHz). Moving to these higher frequencies will support links capable of transmitting up to 100Gbps, which will be required as the communications industry responds to ever increasing demands for data.

Demand also linked to the proportion of radio links versus fibre links

Demand for Filtronic's equipment also depends on the proportion of cell sites that are connected to the fibre backbone via wireless links rather than fibre. Wireless links are currently deployed in more than 50% of cell sites globally, with a much higher proportion in much of India and parts of Asia and Latin America than urban areas of the United States. Replacing existing lower-frequency wireless backhaul with fibre is not always practical or economically viable, so upgrading to E-band microwave links is the most effective way to increase capacity at these sites. In areas where there is no infrastructure in place and a fibre point of presence (PoP) is a few hundred metres away from the radio access point, the cost of adding new fibre may be significantly higher than adding a wireless link because although the cost of the fibre cable itself is reducing, this is typically a fraction of the investment required to trench and install the cable, whereas the cost to supply and install point-to-point, line-of-sight wireless links continues to reduce. Filtronic notes that current market estimates (source: The Ericsson Mobility Report) predict that by 2027, microwave will account for 65% of the installed base of backhaul connections and, based on an 11% CAGR, at least 30% of these wireless links will be high-frequency mmWave, deployed in areas of high traffic density such as airports, sports stadiums and metropolitan areas.

A report from the Dell'Oro Group published in January 2023 noted that while the main backhaul technology early in the 5G deployment cycle was fibre, it expected more deployments in future to take place in locations without accessibility to fibre as well as in countries that have traditionally favoured wireless backhaul systems. The report predicted that microwave transmission systems in E and V bands would grow by around 20% annually for the next five years because of the higher backhaul capacity requirements of 5G networks.

Aerospace and defence

Key partner for aerospace prime

Filtronic's principal products for the aerospace and defence market are highly integrated transmit and receive modules for airborne active electronically scanned array radars. It also offers switched filter banks for radar applications and microwave subsystems used in missile electronics. These applications require complex RF sub-systems to be packed within the limited space of a fighter jet airframe or missile. Filtronic's expertise in hybrid design and assembly is ideal for these applications as it enables the company to provide uniquely small and thermally efficient modules and subsystems for harsh environments and those where weight reduction is critical. The company has been supplying its lead defence and aerospace customer, which is an aerospace prime, with highly integrated transmit and receive modules for airborne applications for more than ten years. It continues to work for this customer on multi-year contracts delivering transmit and receive modules for a range of aircraft platforms. These long-term delivery contracts provide a consistent level of demand for its manufacturing facilities and are supported by a manufacturing execution system, an enterprise resource planning system and a quality management system, which ensure that each component is both fully traceable and matched to the desired performance of the radar system. Filtronic has also worked on several contracts using its RF design expertise in the development and prototyping of next-generation radar systems. Business cycles are long in this sector, involving up to several years of collaborative development with the end client before volume manufacturing commences. However, once in the field, these programmes normally enjoy many years of continuing supply and support revenues. Since there are a limited number of UK-based suppliers with the necessary defence experience, Filtronic is a key partner for the aerospace prime.

Exhibit 3: Transmit and receive module for active electronically scanned array radar



Source: Filtronic

Extending the customer base

Until recently the defence market has been of limited interest to Filtronic because the equipment typically operated at low RF frequencies, providing limited opportunity for differentiation. As defence equipment spending has shifted to higher-frequency and more technically advanced radar and communications products, Filtronic's manufacturing know-how and technical capabilities have become increasingly applicable, enabling it to expand its customer base. In January 2021, Filtronic announced that it had won a contract worth £1.3m from the Defence Science and Technology Lab (DSTL, an executive agency of the UK's Ministry of Defence) for the supply of battlefield radio communications hardware over a 12-month period. This was a new application area at the time. Filtronic successfully delivered prototype product and a limited production run relating to this contract in FY22. DSTL placed another order in July 2022 worth £0.5m for completion in FY23, to design, manufacture and deliver a modular, programmable reference system for testing RF equipment. The new test system will be compatible with land, sea and airborne platforms, enabling it to be used for both outdoor field trials and static laboratory-based testing. Filtronic has been

invited to bid on other similar UK defence programmes with UK defence primes that require innovative multi-frequency RF solutions. During FY22 the company gained Information Assurance for Small and Medium Enterprises (IASME) Governance Gold cyber security accreditation and the company continues to invest into the company's cyber security systems to facilitate more UK defence contract wins.

Although the market for land and ship-based radars is relatively small in comparison to aerospace, it still requires significant numbers of filters, electronic hybrids and RF sub-systems and this, together with emerging electronic warfare applications deploying high-frequency RF technology, represents an attractive market development opportunity for Filtronic. The company won a small land-based contract that was delivered in FY23 and is actively working on other opportunities for land and maritime radars.

Filtronic has also won several small development contracts for filters for defence applications. While these are modest, they have the potential to lead to more substantial projects and give access to a wider customer base. In July 2022, Filtronic announced that one of these development contracts, which was from an existing aerospace and defence customer, has resulted in a £0.4m order to manufacture prototype switched filter bank products for delivery in FY23.

Filtronic also provides contract manufacturing services for aerospace and defence clients, making and testing precision components at scale to individual specifications.

Investment in defence increasing

Intensifying geopolitical tensions are expected to lead to increased defence spending over the coming years. For example, a report from McKinsey & Company published in December 2022 estimated that even if Russia had not heightened security concerns by invading Ukraine, European defence spending would have risen from €296bn in 2021 to €337bn in 2026 (ie a 14% increase). In its low scenario, which factors in the invasion's impact on defence funding, expenditure increases by 53% over the same period to reach €453bn. In its high scenario, which assumes a stronger response, spending increases by 65% to €488bn. In November 2020 the UK government announced a £16.5bn increase in defence spending above its manifesto commitment over the next four years. Together with a pledge to increase defence spending by 0.5% above inflation for every year of the current parliament, this represented an overall cash increase of £24.1bn over four years compared to the prior year budget. Some of the expenditure is being invested in providing enhanced capability and interoperability based on advanced radar systems, using ever more sophisticated RF solutions. In March 2021, the Integrated Review of Security, Defence and Foreign Policy included the commitment to an upgrade of the UK fleet of Typhoon radar systems and the development of the next-generation fast jet platform.

Critical communications market

An essential part of emergency services networks

The emergency services, federal agencies, defence bodies and some private security companies use communications infrastructure that is separate from commercial telecommunications networks. These networks need to be highly reliable even in harsh environments, available even in regions where there is no fibre network and secure. Historically Filtronic has focused on the North American critical communications market, which deploys the P25 network standard and where the market dynamics and the demand for higher resilience and longer-range communication have allowed the company to develop differentiated products.

Initially Filtronic supplied high-performance ceramic filters and combiners and RF conditioning products to this market, building a strong relationship with the leading OEM in this sector. In 2020 this lead customer, which we have [previously inferred](#) is Motorola Solutions, asked Filtronic to

develop a new TTA 'as fast as you can' because the new specification had been released more than 12 months previously. The total development cycle took less than six months, from inception through to product qualification. The newly developed TTA met the updated specification and included performance improvements such as smart redundancy. The system continuously monitors the health of its amplifiers. If one of the amplifiers fails, the system can continue to operate using the spare amplifier. If both amplifiers are lost, the system will function in a bypass mode. The units are compact (229mm × 173mm × 51mm) and light (weighing less than 3.6kg), which reduces tower loading, and are designed to withstand lightning strikes. Filtronic's systems are among a limited number on the market that are fully compliant with stringent US public safety specifications. The client was also interested in inventory reduction and increasing the speed of deployment with a target of reducing lead time from four weeks. Filtronic responded to this request by developing a modular architecture and simplifying the order process. It delivered its first TTA products for its customer to integrate into networks for its customers in May 2021. The customer has declared these TTAs to be 'best-in-class' and the product is being used for P25 programmes that will be implemented in the next 24 months. These TTA products are designed to be OEM agnostic, which has enabled Filtronic to make sales to other organisations outside of its lead customer.

Exhibit 4: Tower top amplifier

Source: Filtronic

Exhibit 5: Customised combiner

Source: Filtronic

Sustained investment in public safety supports long-term growth

Public safety networks typically receive good levels of investment at both city and state level as emergency services look to expand coverage, integrate services and replace legacy analogue networks. In January 2023 The Business Research Company predicted that the global mission-critical communication market size would grow from US\$16.38bn in 2022 to US\$18.10bn in 2023 and then to US\$26.06bn in 2027 (ie at a CAGR of 9.5%). The report cites the rise in security threats related to cyberattacks as a key growth driver.

Historically these networks only supplied high-quality, high-reliability voice communication, so they tend to operate at narrowband microwave frequencies (700–900MHz). However, the communications equipment is evolving to support the speed and data requirements of new technologies used by the emergency services such as body-worn cameras. The market is therefore transitioning to hybrid solutions in which the mission-critical voice communications continue to run over dedicated and secure private communication networks, while non-critical data communications are carried over commercial-grade mobile telecommunication LTE networks. We note that the length of time required for accreditation, approval and adoption in this market is longer than in the commercial telecommunications market, however the length of time between product upgrades is longer too.

Benefiting from on-shoring

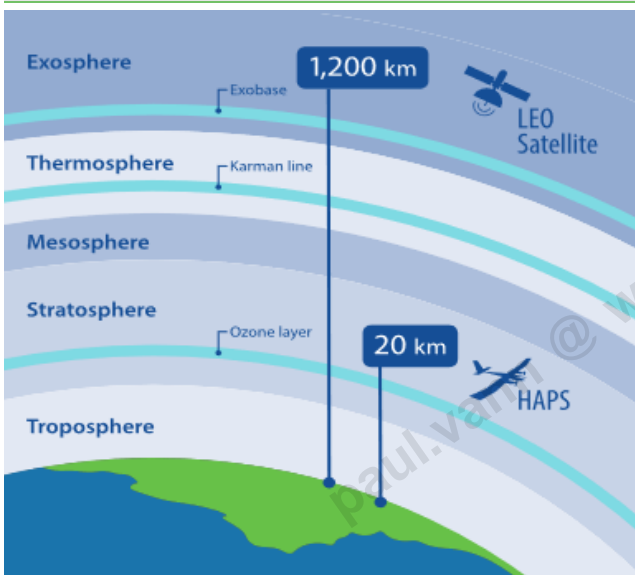
In FY20 Filtronic took the decision to transfer the manufacturing of P25 critical communication network products from a Chinese sub-contractor to its own facility in Maryland, US. The move was primarily designed to improve lead time and customer response times. It has had the additional benefit of positioning the company to benefit from 'America First' procurement policies.

Applying expertise of ultra-reliable networks to other sectors

Filtronic is applying its experience of delivering equipment for ultra-reliable, low latency and/or high-bandwidth public safety networks to other dedicated networks for specific industries. These include rail transportation, banking, utilities, manufacturing and the oil & gas industry. As discussed below, Filtronic is beginning to provide subsystems for some of these sectors.

Space

Exhibit 6: Location of LEO satellites and HAPS



Source: Filtronic

Exhibit 7: Cerus power amplifier for high-capacity point-to-point satellite and HAPS applications



Source: Filtronic

New satellite constellations represent a significant opportunity

Constellations of hundreds of small, interconnected satellites are increasingly being deployed to provide internet connectivity to remote and rural areas where it is impractical and uneconomic to install fibre-optic links. Satellite constellations are also being used to provide environmental monitoring services and asset tracking and are being deployed by governments for Earth observation. Historically, most satellites were deployed in geostationary (GEO) orbits 36,000km above the Earth's surface, with only a few complex, large and expensive satellites in fixed positions required to provide global coverage. Since GEO satellites are so far from the Earth, it takes a radio or light signal around 540 milliseconds to make the round trip from the ground to the satellite and back again. While this is acceptable for TV broadcasting, it is not suitable for internet communications, particularly online gaming, stock trading and other real-time applications. It also means that communication via GEO satellites is too slow for controlling driverless vehicles or tracking hypersonic missiles.

Consequently, the newer constellations designed to provide internet access deploy satellites in low Earth orbits, which are only 1,200km from the Earth's surface. This architecture requires many more satellites to give global coverage. For example, as of end May Elon Musk's Starlink

constellation had nearly 4,200 LEO satellites in orbit. SpaceX, the owner of the Starlink constellation, has approval from the Federal Communications Commission to expand this to nearly 12,000 LEO satellites. OneWeb currently has 648 LEO satellites in orbit, which the company states is sufficient to achieve global coverage. Amazon has also announced its own satellite internet constellation called Project Kuiper, with a target of 3,236 LEO satellites. Under the terms of its FCC licence, it needs to have at least half of the constellation deployed and operating by July 2026 and it is preparing to launch two prototype satellites imminently.

Since there are so many satellites in these constellations, the traditional space industry procurement model of building customised equipment for individual satellites has had to be replaced by a more conventional commercial procurement model requiring suppliers to be able to deliver many hundreds of units in a timely and cost-effective manner. This shift represents a significant opportunity for Filtronic because it has both the RF design skills and volume manufacturing capability.

Some constellations, for example Starlink but not OneWeb, have communications links between the satellites themselves as well as to the Earth and back. Having inter-satellite links means that if a satellite receives a signal while it is above a region where there are no ground stations, or only ground stations owned by a hostile entity, it can transmit the signal back to Earth via a chain of inter-connected satellites. The shift to inter-satellite links creates additional opportunity for Filtronic.

Other platforms collectively referred to as high-altitude platform stations (HAPS) have been proposed as alternatives to LEO satellites. Google's Loon project, which was started in 2011, was intended to provide internet access to people in rural and remote areas using a network of high-altitude communications balloons. The technology worked and was used to provide emergency communications to around 100,000 people in Puerto Rico following the devastation caused by Hurricane Maria in 2017. However, the project was not viable from an economic perspective. Users could lose connections if winds blew balloons off course. The solar-powered equipment on-board restricted the regions where the technology could be deployed. Crucially, the balloons cost tens of thousands of dollars each and needed to be replaced every five months as their plastic shells degraded, while there were few people in rural communities in the developing world able to pay for internet access. Google shut down Loon in 2021, stating that it was not a 'long-term, sustainable business'. Facebook intended to construct a commercial airborne network based on its proprietary Aquila high-altitude solar power glider. This project was shelved in 2018, after two test flights, with Facebook announcing that it was continuing to work on a HAPS-based network, but with partners such as Airbus, which has developed its own Zephyr platform. In 2021 Airbus and NTT DOCOMO used a Zephyr to carry out tests that demonstrated the viability of stratospheric communications to devices such as smartphones. In 2022 Airbus signed a strategic partnership agreement with a Saudi telecommunications company to progress the development of HAPS-based connectivity and Earth observation services for the Kingdom of Saudi Arabia and a letter of intent with Space Compass for a cooperation agreement to service the Japanese market with mobile connectivity and Earth observation services.

mmWave transmission is a good option for links between a satellite, unmanned aerial vehicle or aircraft and the ground even though mmWave links do not deliver as high a data rate as free-space laser communications links. This is because mmWave technology is completely proven and transmission in certain frequencies, including E-band, is not seriously affected by rain or water vapour.

Dedicated offer for space applications

Since Filtronic has been supplying compact, highly integrated, reliable and cost-effective E-band backhaul telecommunications products in volume for over a decade, Filtronic was a natural choice for HAPS pioneers. The company worked on two important development programmes with large West-Coast US technology companies. While both programmes were eventually shelved, the work

showed that Filtronic's technology for horizontal line-of-sight links could be applied to vertical line-of-sight links over extended distances as well, and that Filtronic was able to meet the aggressive development time scales required. The HAPS-related development work was the foundation of Filtronic's Cerus product line, which is dedicated to space-applications including deployment on LEO satellites. Cerus modules are based on Filtronic's proprietary MMIC chips and are provided in a small form factor in a range of power outputs at E-band frequencies. The company is working on demonstration products at Ka, Q and V band frequencies for this sector.

In January 2023 Filtronic announced it had secured a contract with a new customer, which is a global provider of LEO satellite communications equipment. The contract is worth more than £2.0m, with revenue recognition expected in CY23. Filtronic will be delivering a customised version of its Cerus SSPA module for the contract. The customised modules and associated control boards will be installed in selected ground stations for commercial trials of the E-band Earth station antenna links to and from the LEO satellite. This will be the first time that high-bandwidth E-band frequencies have been used in an operational LEO application. In July, the company announced a contract with the [European Space Agency](#) worth €3.7m/£3.2m. This is focused on the development of multifrequency transceiver technology for satellite payload feeder links.

Adjacent growth markets

Filtronic continues to develop opportunities in adjacent markets where it can leverage its existing technology and capability, particularly applications in the licenced Q, V, E, W and D-bands. Filtronic's Morpheus modules are a good basis from which to develop systems for other applications because they have a footprint of 90mm × 80mm and weigh only 110g. Emerging application areas include:

- **Low-latency private networks:** E-band links that meet 5G capacity requirements offer the user lower latency than that of a fibre cable of the same length. This makes private point-to-point mmWave links a more attractive solution for latency-critical applications such as automated, high-frequency financial trading systems, where reduced transaction times create a competitive advantage when trading shares. Filtronic has designed and supplied highly customised versions of its Orpheus and Morpheus E-band links to customers servicing the financial services market. These links have a significant advantage with respect to power consumption because they use Filtronic's own MMICs. In December 2020 Filtronic secured a £0.4m development contract for a low-latency private network. In March this year this was followed by a contract worth US\$0.8m (£0.6m) with a different customer for the design, development and manufacture of high-performance power amplifier modules, which will be incorporated into next-generation point-to-point microwave radios. The customer operates high-performance microwave and mmWave private networks. Management expects the revenue attributable to this contract will be recognised in FY24. Post year-end, the company announced it had won a further two contracts, each worth £0.5m, for delivery in CY24. Other applications where low-latency high-capacity networks could deliver significant advantages are plant safety control systems, security monitoring and autonomous vehicle controls.
- **5G test equipment:** the increased use of components operating at frequencies up to 55GHz presents challenges for test equipment manufacturers and creates an opportunity for Filtronic to design and manufacture modules operating at these higher frequencies for incorporation in automatic test equipment. In February 2020, the company received a US\$1.0m contract to develop over-the-air 5G mmWave modules for a leading RF test equipment company in the United States. These modules extended the frequency range of the customer's existing product offering above 50GHz. The development contract was followed in October 2021 by a contract valued at US\$0.8m (c £0.6m) to make pilot phase production units. In June 2022 Filtronic received a follow-on contract for full production units valued at US\$0.9m (c £0.7m) for delivery during FY23.

- **Quantum computing:** recent developments in [quantum computing](#) require integrated switch filter banks that are able to operate both at room temperature and in cryogenic chambers where they have to withstand very low temperatures for extended periods. In July 2022, Filtronic announced the award of a contract from a quantum computing company for the design, development and supply of microwave filters and diplexers. They will be used within the microwave circuits of both the external control rack and the cryogenic dilution refrigerator of a quantum computer. Management expects that the contract, worth £0.35m, will be completed during FY23 and believes that it could lead to further work.

Management

Jonathan Neale became non-executive chairman in November 2021 following the retirement of Reg Gott. Jonathan had previously been chief operating officer of McLaren Group for five years, prior to which he held a number of executive roles including CEO of McLaren Racing F1 between 2001 and 2016. Before that Jonathan was managing director of Hawk Military Aircraft at BAE Systems, UK. He has hands-on experience of high-frequency design, having begun his career as a research physicist in high-frequency semiconductor design and application, then leading the advanced development group in the electronic warfare division of Philips Defence Systems.

Richard Gibbs became CEO in September 2020. Richard is an experienced director who has led a number of business operations supplying semiconductor, RF and electronics subsystems to the telecoms, aerospace, defence, medical and oil & gas markets. He joined Filtronic from Micross Components, a private equity-owned company, where he had been managing director since 2016. Prior to that, he spent nine years at E2V Technologies, where he was group sales and marketing director and president of the RF Product and Hi-Reliability Semiconductors divisions, and 20 years with Honeywell, of which 10 years were spent managing overseas operations.

Michael Tyerman joined Filtronic in 2007 and became chief financial officer in April 2016. Prior to joining Filtronic, Michael held various positions at Procter and Gamble, Huntsman Polyurethanes and Komatsu.

Sensitivities

Customer concentration: Filtronic has a limited number of potential customers because the telecommunications equipment market is dominated by a few giant companies. Consequently, it is highly dependent on its relationships with three key customers. During FY23 these three customers collectively accounted for 73% of revenue (FY22: 81%), with the largest accounting for 34% of the total and the second largest 22%. In FY23, a fourth customer became a 10%+ customer, contributing 12% of revenue. We note that Filtronic has very long-term relationships with the three largest customers, effectively functioning as an extension to their RF design and manufacturing operations and providing RF modules for use in multiple end-products. It would be time consuming and risky for each of these customers to bring the work in house and difficult for them to find alternative suppliers with the same range of capabilities. Working with large customers with strong positions in their respective markets means that Filtronic is engaged with partners who are defining the direction of the market and require products at sufficiently high volumes to give Filtronic the benefit of economies of scale. For example, Motorola Solutions' land mobile radio sales totalled US\$4.7bn in 2022 and, according to Coherent Market Insights, the global land mobile radio system market was valued at US\$17.3bn in 2021.

Component availability: like other electronics companies, Filtronic has had to contend with shortages of certain electronic components. Since the company has in-house expertise, in some

cases it can redesign and requalify products to make use of alternative material at short notice, mitigating the direct impact of supply chain challenges. However, Filtronic's RF products are typically part of a larger communication solution, so the company is also affected indirectly by problems elsewhere in the supply chain. For example, during H123 a key customer in the public safety communications market experienced component shortages that prevented it from completing systems incorporating Filtronic modules. In addition, some of Filtronic's own deliveries for mobile telecommunications infrastructure and defence applications were delayed from H223 into FY24 because Filtronic struggled to purchase some specific semiconductor components. Supply chain issues may ultimately benefit Filtronic because they are encouraging electronics OEMs to work with companies that are located in the same country or continent. The issues are also encouraging customers to place contracts covering longer time scales, giving better visibility of revenues.

Speed of 5G roll-out: uptake of Filtronic's E-band transceivers for mobile communications applications is very dependent on the roll-out of 5G networks, particularly in regions outside China, reflecting the activity of its major telecommunications customer. This customer has stated that it expects a 2% decline (in constant currency) in the total addressable mobile networks market excluding China to €53bn during 2023, with 5G deployments in India following the formal launch of 5G services there in October 2022 not quite offsetting a weaker North American market. Transceiver uptake is also very dependent on whether regions rolling-out 5G networks already have fibre connectivity for backhaul, as is common in the United States, or are reliant on mmWave links for backhaul, as is typical in India.

War in Ukraine: Filtronic has not been directly affected by the war as it had no customers in Russia or Ukraine. While its major telecommunications customer exited the Russian market, the country accounted less than 2% of net sales in 2021, so the absence of exports to Russia was offset by strong demand in other areas. In the longer term, the war may be beneficial for Filtronic as NATO members supplying weapons to Ukraine restock (see above).

Recruitment: Filtronic is very dependent on the availability of engineers with second degrees in RF engineering. There are very few universities offering this training. However, Filtronic does not appear to have a major problem with recruiting and retaining suitably skilled personnel. In November 2022 Filtronic opened a new design centre in Manchester, UK, focused on developing mmWave technology for satellite communications applications. The centre employs five RF engineers, with another two scheduled to join the team shortly.

Financials

Review of FY23 results

The table below summarises Filtronic's performance in FY23.

Exhibit 8: Filtronic FY23 results highlights					
£m	FY22	FY23e	FY23a	Diff	y-o-y
Revenues	17.1	16.6	16.3	-2.2%	-4.6%
EBITDA	2.8	1.3	1.3	-4.2%	-54.8%
EBITDA margin	16.5%	8.0%	7.8%		
Normalised/reported operating profit	1.6	0.3	0.2	-19.3%	-85.0%
Normalised/reported operating margin	9.3%	1.8%	1.5%		
Normalised/reported PBT	1.5	0.1	0.1	-55.4%	-95.7%
Normalised net income	1.2	0.3	0.1	-51.8%	-87.8%
Reported net income	1.5	0.3	0.5	59.5%	-68.4%
Normalised basic EPS (p)	0.54	0.14	0.07	-51.8%	-87.8%
Normalised diluted EPS (p)	0.53	0.13	0.06	-51.9%	-87.9%
Reported basic EPS (p)	0.68	0.14	0.22	59.5%	-68.5%
Dividend per share (p)	0.00	0.00	0.00	N/A	N/A
Net debt/(cash) excluding property leases	(3.2)	(3.0)	(1.6)	-46.1%	-49.0%

Source: Filtronic, Edison Investment Research

FY23 revenue declined 4.6% y-o-y, with the shortage of certain semiconductor components affecting the ability to ship some product in H223; the company estimates this pushed c £1.5m of revenue from H223 into FY24. On a market basis:

- Xhaul including space c £8.2m: increased 40% y-o-y, with a small increase in 5G-related revenue and a c £2m first-time contribution from the space market. Demand was boosted by network providers building inventory to support the construction of networks in India following the regulatory authority approving the release of E-band and V-band licences in August 2022.
- Aerospace and defence c £4.3m: revenue declined 41% y-o-y reflecting the completion of earlier contracts and a pause before new projects start.
- Critical communications c £3.3m: revenue declined 20% y-o-y. While there was strong demand for tower-top amplifiers this was offset by lower sales of other products because a key customer had experienced component shortages, which prevented it from completing systems incorporating Filtronic modules.
- Other: this category contributed revenue of c £0.5m.

Adjusted EBITDA reduced by £1.5m to £1.3m. Margins were adversely affected by an unfavourable product mix with a higher proportion of mobile telecommunications transceivers. In addition, indirect costs (£10.0m) were 6% higher year-on-year because of investment in sales channels and engineering in support of the company's diversification strategy. The company reported a tax credit of £0.4m resulting in profit after tax of £0.5m for FY23. The company had £15.8m in unrecognised tax losses at the end of FY22. With better visibility over future growth and profitability, the company recognised an element of these losses in FY23, increasing the deferred tax asset. During our forecast period, we do not expect Filtronic to pay tax.

Strong balance sheet

Net cash excluding property leases declined from £3.2m to £1.6m over the year. Net cash generated from operating activities of £1.0m reflected a £0.4m working capital outflow. While inventory was higher (reflecting delayed shipments due to component shortages) and higher accounts receivable reflected Q4 weighted sales, trade creditors were also higher at year-end reflecting a large capex spend in Q4. The company capitalised development costs of £0.5m (W-band chipset and space market product development) and spent £1m on capex including a fully automated wedge bonder, which enables Filtronic to work on specialist defence projects for new

and existing customers requiring higher volumes of parts. Year-end cash of £2.6m enables the company to make the investments required to address new adjacent markets. Management also noted that it was considering asset finance for some of its capex, which would free up further cash.

Forecasting strong growth in FY24 and FY25

Revenues: the company's three established markets of mobile telecommunications infrastructure, aerospace and defence, and public safety communications networks are relatively unaffected by reductions in consumer spending. We therefore assume that revenues will pick up strongly in FY24 now that the specific component shortages have eased. In addition, recent contract wins confirm that Filtronic is diversifying successfully into the rapidly growing space communications market. We forecast revenue growth of 27% for FY24 and 10% for FY25, assuming continued progress in expanding the customer base.

Margins and indirect costs: we model costs of sales/revenues at 40.3% in FY24 and 39.0% in FY25 versus 36.8% in FY23, reflecting a higher percentage of lower-margin 5G XHaul revenues in FY24. Management expects to continue to add to the sales and engineering cost base during FY24 to support growth through diversification. We model a 12.5% y-o-y increase in indirect costs (pre-depreciation and amortisation) to cover the cost of additional engineering personnel together with the impact of inflation on wages and energy costs and a 10% increase in FY25.

Investment costs: we maintain capitalised R&D at FY23 levels (£0.5m). We model £0.8m expenditure on capital equipment in FY24, primarily for a system for the plastic encapsulation of MMICs, which will support work on defence contracts, reducing to £0.4m in FY25.

Exhibit 9: Changes to forecasts

£m	FY24e old	FY24e new	Change	y-o-y	FY25e new	y-o-y
Revenues	20.7	20.7	-0.2%	27.0%	22.7	10.0%
EBITDA	2.1	2.2	3.5%	73.4%	2.7	23.4%
EBITDA margin	10.3%	10.7%			12.0%	
Normalised/reported operating profit	1.1	0.9	-15.8%	289.7%	1.4	55.8%
Normalised/reported operating margin	5.3%	4.5%			6.3%	
Normalised/reported PBT	0.9	0.7	-26.8%	982.0%	1.2	74.5%
Normalised net income	0.9	0.7	-21.8%	393.9%	1.2	74.5%
Reported net income	1.1	0.7	-36.7%	49.2%	1.2	74.5%
Normalised basic EPS (p)	0.41	0.32	-21.8%	394.0%	0.56	73.5%
Normalised diluted EPS (p)	0.41	0.32	-22.1%	394.3%	0.56	73.5%
Reported basic EPS	0.51	0.32	-36.7%	49.3%	0.56	73.5%
Dividend per share (p)	0.00	0.00	N/A	N/A	0.00	N/A
Net debt/(cash)	(3.8)	(1.8)	-51.6%	12.9%	(2.4)	33.1%

Source: Edison Investment Research

Valuation

There are very few other listed companies specialising in high-power mmWave communications products, not just in the UK but also across mainland Europe, Israel and North America. While this emphasises the uniqueness of Filtronic's skill set, it makes it difficult to create a sample of peers to use as the basis of a peer multiples comparison. Given the lack of direct peers and the volatility in EBITDA margin, we prefer a DCF approach for valuing Filtronic. This models the impact on EBITDA and indicative valuation if diversification into new markets such as satellite communications enables Filtronic to deliver sustained double-digit revenue growth between FY24 and FY28, in line with management's objectives, while at the same time the indirect cost base stays close to FY25 levels.

We model revenue growth between FY26 and FY28 of 8.0% to 12.0% and growth in indirect costs at 3.0% to 7.0%. Throughout the period, costs of sales/revenues is modelled at 39%, which is the same as FY25. Management indicated that in the longer term, it is targeting an EBITDA margin in

the range 20–25% and our DCF models margins rising to 19.6% by FY28 for the base case of revenue growth of 10% and indirect cost growth of 4%. Investment in intangible and tangible assets is maintained at FY25 levels. The calculation uses a WACC of 11.0% and a terminal growth rate of 3.0%.

Exhibit 10: DCF analysis

FY26e EBITDA (£m)						
		Year-on-year sales growth FY26–28e				
		8.0%	9.0%	10.0%	11.0%	12.0%
Indirect cost growth	3.0%	3.5	3.6	3.8	3.9	4.0
	4.0%	3.4	3.5	3.7	3.8	3.9
	5.0%	3.3	3.4	3.5	3.7	3.8
	6.0%	3.2	3.3	3.4	3.6	3.7
	7.0%	3.0	3.2	3.3	3.5	3.6
Indicative value (p/share)						
		Year-on-year sales growth FY26–28e				
		8.0%	9.0%	10.0%	11.0%	12.0%
Indirect cost growth	3.0%	15.4	16.8	18.2	19.6	21.0
	4.0%	14.2	15.6	17.0	18.4	19.9
	5.0%	13.1	14.4	15.8	17.2	18.7
	6.0%	11.9	13.2	14.6	16.0	17.5
	7.0%	10.6	12.0	13.4	14.8	16.2

Source: Edison Investment Research

The analysis indicates that if management's diversification strategy delivers double-digit year-on-year growth between FY26 and FY28, while year-on-year growth in indirect costs is held at 4.0% or less, further uplift in the share price should be justified. For example, Exhibit 10 shows that if Filtronic can deliver 10% revenue growth each year between FY26 and FY28, coupled with year-on-year cost growth of just 4% over the same period, our DCF would produce an indicative value per share of 17.0p, 10% higher than the current level.

Exhibit 11: Financial summary

Year end May	£m	2021	2022	2023	2024e	2025e
INCOME STATEMENT						
Revenue		15.6	17.1	16.3	20.7	22.7
EBITDA		1.8	2.8	1.3	2.2	2.7
Operating profit (before amort. and excepts.)		0.6	1.6	0.2	0.9	1.4
Amortisation of acquired intangibles		0.0	0.0	0.0	0.0	0.0
Exceptionals		0.1	0.4	0.0	0.0	0.0
Reported operating profit		0.6	2.0	0.2	0.9	1.4
Net Interest		(0.4)	(0.1)	(0.2)	(0.2)	(0.2)
Exceptionals		0.0	0.0	0.0	0.0	0.0
Profit Before Tax (norm)		0.1	1.5	0.1	0.7	1.2
Profit Before Tax (reported)		0.2	1.9	0.1	0.7	1.2
Reported tax		(0.2)	(0.4)	0.4	0.0	0.0
Profit After Tax (norm)		0.3	1.2	0.1	0.7	1.2
Profit After Tax (reported)		0.1	1.5	0.5	0.7	1.2
Discontinued operations		0.0	0.0	0.0	0.0	0.0
Net income (normalised)		0.3	1.2	0.1	0.7	1.2
Net income (reported)		0.1	1.5	0.5	0.7	1.2
Average Number of Shares Outstanding (m)		213	215	215	215	216
EPS - normalised (p)		0.14	0.54	0.07	0.32	0.56
EPS - normalised fully diluted (p)		0.14	0.53	0.06	0.32	0.56
EPS - basic reported (p)		0.03	0.68	0.22	0.32	0.56
Dividend (p)		0.00	0.00	0.00	0.00	0.00
BALANCE SHEET						
Fixed Assets		6.2	5.4	7.4	8.0	8.3
Intangible Assets		1.7	1.5	1.8	2.0	2.2
Tangible Assets		3.3	3.0	4.3	4.8	4.8
Investments & other		1.2	0.9	1.3	1.3	1.3
Current Assets		8.4	11.1	10.7	9.7	11.0
Stocks		2.2	2.6	2.8	3.5	3.9
Debtors		3.3	4.5	5.3	3.4	3.7
Cash & cash equivalents		2.9	4.0	2.6	2.8	3.4
Other		0.0	0.0	0.0	0.0	0.0
Current Liabilities		(3.6)	(4.0)	(4.8)	(3.8)	(4.2)
Creditors		(2.4)	(3.0)	(3.7)	(2.7)	(3.0)
Short term borrowings including lease liabilities		(0.6)	(0.5)	(0.6)	(0.6)	(0.6)
Other		(0.6)	(0.5)	(0.5)	(0.5)	(0.5)
Long Term Liabilities		(1.7)	(1.4)	(1.7)	(1.7)	(1.7)
Long term borrowings		(1.6)	(1.3)	(1.7)	(1.7)	(1.7)
Other long term liabilities		(0.1)	(0.1)	(0.0)	(0.0)	(0.0)
Net Assets		9.4	11.0	11.5	12.2	13.4
Minority interests		0.0	0.0	0.0	0.0	0.0
Shareholders' equity		9.4	11.0	11.5	12.2	13.4
CASH FLOW						
Op Cash Flow before WC and tax		1.8	2.8	1.3	2.2	2.7
Working capital		1.1	(0.8)	(0.4)	0.2	(0.3)
Exceptional & other		(1.0)	0.3	0.0	0.0	0.0
Tax		0.5	0.0	0.0	0.0	0.0
Operating Cash Flow		2.5	2.3	0.9	2.4	2.4
Capex (including capitalised R&D)		(0.4)	(0.3)	(1.5)	(1.3)	(0.9)
Acquisitions/disposals		0.0	0.0	0.0	0.0	0.0
Net interest		(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Equity financing		0.0	0.0	0.0	0.0	0.0
Dividends		0.0	0.0	0.0	0.0	0.0
Other		0.0	0.0	0.0	0.0	0.0
Net Cash Flow		1.9	1.9	(0.8)	0.8	1.2
Opening net debt/(cash)		0.7	(0.8)	(2.2)	(0.3)	(0.5)
FX		0.0	0.0	0.0	0.0	0.0
Other non-cash movements		(0.4)	(0.4)	(1.1)	(0.6)	(0.6)
Closing net debt/(cash) including lease liabilities		(0.8)	(2.2)	(0.3)	(0.5)	(1.1)
Property lease liabilities		1.2	1.0	1.3	1.3	1.3
Closing net debt/(cash) excluding property lease liabilities		(2.0)	(3.2)	(1.6)	(1.8)	(2.4)

Source: Filtronic, Edison Investment Research

Contact details Plexus 1, NETPark, Thomas Wright Way, Sedgefield, County Durham TS21 3FD +44 1740 618 800 www.filtronic.com	Revenue by geography
Management team	
Non-Executive Chairman: Jonathan Neale Prior to becoming chairman of Filtronic in November 2021, Jonathan Neale was chief operating officer of McLaren Group for five years. Between 2001 and 2016, he held a number of executive roles including chief executive officer of McLaren Racing F1. Before that Jonathan was managing director – Hawk Military Aircraft at BAE Systems, UK. He has hands-on experience of high-frequency design, having begun his career as a research physicist in high-frequency semiconductor design and application, then leading the advanced development group within the electronic warfare division of Philips Defence Systems.	CEO: Richard Gibbs Richard is an experienced director who has led a number of business operations supplying semiconductor, RF and electronics subsystems to the telecoms, aerospace, defence, medical and oil & gas markets. Richard joined Filtronic from Micross Components, a private equity-owned company, where he had been managing director since 2016. Prior to that Richard spent nine years at E2V Technologies, where he was group sales and marketing director and president of the RF Product and Hi-Reliability Semiconductors divisions, and 20 years with Honeywell, of which 10 years were spent managing overseas operations. He took up his appointment as CEO in September 2020.
CFO: Michael Tyerman Michael joined Filtronic in 2007 as financial controller of the broadband business, and was promoted to group financial controller in 2009 and then to CFO in 2016. Prior to joining Filtronic, Michael held various positions at Procter and Gamble, Huntsman Polyurethanes and Komatsu, which included time working in the Benelux and Nordic regions.	
Principal shareholders	(%)
Mark and Diana Dixon	19.2%
Canaccord Genuity Group	12.0%
David and Monique Newlands	12.0%
Harwood Capital LLP	5.1%
River and Mercantile Asset Management LLP	5.0%
Michael and Alice Bennett	3.3%

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