

THE SHAPE OF POWER TO COME



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Low harmonic drive technology

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If you have a high number of drives

(also referred to as variable-speed

motor drives) on site, you are

generating electrical disturbances.

LHD = a standard 6-pulse drive + filter technology

These disturbances include network unbalance, flicker, and especially harmonics - not to mention the risk of regulatory non-compliance. Those working in the marine, offshore, and water treatment industries are especially vulnerable to these problems.

For decades the common filter solution has been active front end (AFE), but there's a modern solution that offers an improved competitive advantage. With active filter, technology, you get a more compact solution that enables fewer losses and less total harmonic distortion (THD).

ADF Power Tuning is the most flexible system available to help you achieve an LHD. And there's no comparison when it comes to price: ADF Power Tuning can save you up to 40%* in total cost of ownership compared to AFE. It's a versatile yet powerful solution that takes the hassle out of installation and operation.

Read on to learn what makes ADF technology the smart choice for your operation.



* based on internal calculation

USE OUR COMPONENTS TO YOUR ADVANTAGE

Because ADF Power Tuning components can be combined with a drive to create the ultimate low harmonic solution, it's ideal for system integrators or OEMs (original equipment manufacturers). We can give you the components you need to succeed in any application. See page 18 for more information.

Technology that makes energy more efficient

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Engineered in Sweden, ADF Power Tuning provides

a unique way of saving energy in a vast range of

applications such as industrial production machines

and generator systems.

It works by sensing electrical behavior, then removing energy losses by correcting the electrical behavior. This is achieved by using state-of-the-art signal processing and advanced control structures to manage the power flow to and from the machine with a power processor (power converter). By continuously monitoring the network and injecting exactly the right amount of compensation current—at exactly the right time—the most efficient and accurate solution to any power quality problem can be achieved.

manufactured in

LOAD CURRENT



LINE CURRENT



ADF Power Tuning vs. Competitors

Compared to other power quality technologies, ADF Power Tuning provides a solution that is hard to beat. It is an efficient system that leads to low losses, but more than that, it provides a reliable tool box that can seamlessly address a variety of disturbances, from THD to flicker.

specific project.

		ADF	
Losses		•	
Total harmonic distortion		•	
Physical size		•	
		ADF	
Meets regulation*		•	
Specified harmonic selection	n	•	
Resonance elimination			

Although other solutions will meet some of your needs, you can rely on ADF Power Tuning to meet all of them.

* IEEE519, G5/4, EN61000, etc

Flicker compensation

Configurable

And while most power quality products can help you meet regulations in some sense, we do that with a lighter, more compact solution. The modular structure of ADF Power Tuning also allows for flexibility for the future and adaptability for your



What to expect with **ADF** Power Tuning

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An ADF unit is basically a very advanced

computer-controlled current generator

with the ability to instantly produce any shape

or form of compensation current.

A simplified diagram of the operating principle is shown in the figure below. Each ADF unit is connected in parallel, in shunt, with the load that requires compensation. The power flows of electrical currents between the load and the network are measured and analyzed [1] to determine if disturbances such as reactive displacement and/or harmonics are present.

If found, the ADF unit injects phase currents [2] that are the exact opposite of, for example, the harmonics and/or reactive displacement. This is done in order to cancel out the load behavior [3].

The result is an ideal load with a minimum of power losses and disturbances. The energy profile then appears ideal to the transformer.







Since one module supports multiple drives, you can save space and ensure flexibility for the future.

TIME

Avoid unnecessary downtime for maintenance or replacement of equipment affected by power quality issues.

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SECURING REGULATORY COMPLIANCE

When it comes to regulatory compliance, you need a solution you can depend on. But more than that, why not consider a solution that leaves room for growth? With ADF Power Tuning, you can remain care-free in the knowledge that this low harmonic solution will ensure you meet necessary standards. See some examples here on the left.

MAINTAIN YOUR EQUIPMENT WARRANTIES

With increasingly sensitive equipment, come stricter technical infrastructure demands and increasing electrical disturbances. Avoid this concern over loss of warranties with a stable and reliable power quality solution.

EXTEND YOUR EQUIPMENT LIFETIME

replacement.





Increase energy efficiency while reducing the expense of replacing worn equipment.



HASSLE

ADF-type technology is already being included in regulatory demands and equipment warranties — a trend that/will only continue to grow.

A reliable power quality solution ensures that unstable power is compensated. With ADF Power Tuning, you lower the risk for wear, expensive shutdowns, and

The ADF range

Within the ADF Power Tuning family, we have a modular collection with a small set of components. With a short list of spare parts, our liquid cooling and air cooling capabilities, and a full voltage range, you get a high degree of reliability and flexibility.



[70–130 A]

The ADF P100 is ultra-efficient and easy to use. The wall-mounted cabinet is a cost-effective package that allows the use of ADF technology in applications where saving space and weight are optimal. Several ADF P100 units can be used in parallel, and the ADF P100 can also be used in Sensorless operation for harmonics compensation. The ADF P100 is available in three-wire versions (70–130 A) and in a four-wire version-the ADF P100N (100 A, 300 A Neutral).

SOME TYPICAL APPLICATIONS INCLUDE

- Maritime vessels
- Offshore oil rigs
- Drive systems
- Data centers
- Pump applications
- Offices and commercial buildings
- Medical equipment
- Industrial loads
- UPS systems
- Fans
- HVAC

ADF P100

ADF P100 active filters give you the compensation

capabilities you need in a compact cabinet.

It's small and cost-effective, but the ADF P100

features the cutting-edge performance you can expect

with ADF Power Tuning.

ADF P200

The ADF P200 is the powerhouse you need when all else fails. It reads faster and corrects faster than other solutions, but its true specialty is eliminating resonances and mitigating interharmonics where other solutions simply can't. You can rely on this solution to compensate at higher frequencies than any other filter.

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[120 A]

The ADF P200 is a compact, wall-mounted product. Available as a stand-alone unit or component (the PPM200), the ADF P200 is highly specialized and compatible with all three-phase low-voltage applications. The component PPM200 can be installed into the ADF P300 as well as be deployed in system integration projects. It is ideal for eliminating resonances both in current control and Sensorless operation, as well as for mitigating interharmonics.

SOME TYPICAL APPLICATIONS INCLUDE

- Offices and commercial buildings
- Small- and medium-sized manufacturing companies
- Fluorescent lamps
- Medical equipment
- Industrial loads
- UPS systems
- Fans
- Drive systems
- HVAC

< 20 µs





active filter.

[90-450 A]

ADF P300

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With the ADF P300, the state-of-the-art performance of our active filter technology comes encased in a compact cabinet, although larger than the ADF P100. Each ADF P300 system is delivered with 90-450 A optimization power and the modular design makes it easy and convenient to add future upgrades. The modularity also ensures superior scalability—up to 1/5 units can be used in parallel.

The ADF P300 is compatible with all three-phase low voltage applications. Beyond harmonics and reactive compensation, the ADF P300 can also be used for flicker control, harmonics with Sensorless operation, and load balancing. The ADF P300 can also be tailored to unique applications requiring special optimization.

SOME TYPICAL APPLICATIONS INCLUDE

- Offices and commercial buildings
- Fluorescent lamps
- Medical equipment
- Industrial loads
- UPS systems
- Fans
- Drive systems
- Maritime vessels
- Offshore oil rigs
- HVAC

ADF P300

The ADF P300 is the ideal active filter for small and medium size commercial and industrial loads. It is a versatile solution and the best choice for most applications because it is such a flexible

• Small and medium sized manufacturing companies

STATCOM systems in electricity networks

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ADF STATCOM installation at the Fortum wind farm in Kville, Sweden.

The ADF P700 STATCOM is a high power, utility grade, medium voltage STATCOM for heavy industrial loads. It is ideal for dynamic reactive compensation, flicker mitigation, and harmonic suppression in applications such as electric arc furnaces (EAFs), cranes, hoists and wind farms. In industries with such a high power demand, there is a concurrent need for a powerful power quality solution. That's when you need the STATCOM. ADF P700 STATCOMs can be integrated into existing on-site structures or can be commissioned with their own housing.



KEY FEATURE	ADF P100
Compact, wall mounted	•
Harmonics compensation	•
Reactive power compensation	•
Eliminates resonances	
Interharmonics compensation	
Flicker compensation	•
Load balancing	•
Medium voltage applications	
Available with liquid cooling	
Four-wire version	•
Voltage range	208-690 V
Industrial	•
Commercial	•
Utility	
Marine, offshore	•
Sensor-less control	

brochure.

ADF product comparison

Our products solve a variety of problems and are suitable for a range of industries. Explore this comparison chart and see which product might be right for your operation. For a consultation, reach us at the number on the back of this



Added features to boost your performance

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Members of the ADF Partner Network come together at MAN for a site visit during the 2015 ADF Partner Conference in Germany

Global service network and support

With the ADF Partner Network, you get access to our global service network. Regionally, ADF partners manage commissioning, service, and local support, but these local teams are backed by our centralized support team for more advanced cases.

MAINTENANCE AROUND THE WORLD

In addition to our commissioning service, we also provide service contracts and product maintenance around the world. But we can also use the remote operation capabilities as part of our WUI to conduct quick initial assessments off-site.

Whether you are a customer or a partner within our network, to help you get the most out of ADF products, we also provide hands-on training as part of a program called ADF Academy. No matter where you are in the world, which application you are working with, or where you are in your implementation, we offer these courses to enable you and your team to gain confidence and expertise.

NO CTs necessary

CONTROL YOUR

COMPENSATION SETTINGS

LIVE FEED OF VARIOUS

MEASUREMENTS

HARMONICS

FOR EACH FREOUENCY

When you need a retrofit solution or you have a complicated set-up, it can be very difficult to add the CTs (current transformers). But with Sensorless Control, we can compensate without it - so you can eliminate the CTs altogether. This gives you more flexibility when it comes to where and how to install the ADF unit and reduces the overall hassle of installation and compensation. In addition to this, you are also able to isolate sub-grids and compensate background distortion, which further improves the flexibility and adaptability of the ADF platform.

Sensorless Control is now available on all ADF products.



Remote operation works for you

The WUI is a web application requiring no additional software installation. It offers a convenient, easy-to-use service to enable you to monitor your ADF modules from any device-anywhere, anytime. Additionally, the WUI can be integrated into a larger system (i.e. with multiple generators, many loads, etc.), which you can then choose to run on a certain schedule or operation mode. And if your operation uses a PLC, the PLC can read out critical data from the ADF module automatically.

The WUI also allows us to make commissioning faster and easier for you by allowing our team to support you via remote operation. And further down the line, if your system needs fine tuning or a support issue occurs, we have a simple way of being able to access the system and evaluate the situation.

The only solution with Sensorless Control

System integration

The ADF system integration program is a unique concept to customize and integrate ADF Power Tuning components, or what we can refer to as building blocks, in your projects and products.

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Our "building blocks" include the PPM 300 inverter module, the SCC2 control computer, and other internal components that enable you to get a complex, functioning, and integrated system quickly. For those who want to utilize existing manufacturing resources, system integration is the smart choice for you.

LHD = a standard 6-pulse drive + filter technology

With system integration, you can leverage the capabilities built into our standard products by using our building blocks (components).

HOW CUSTOMIZABLE IS IT?

- Available as air-cooled or liquid-cooled

With system integration, you get a power quality solution perfectly adapted to you. Add reduced maintenance costs due to small set of components, and you get a highly efficient, highly flexible solution.

KEY APPLICATION AREAS

- MCCs (motor control centers)
- Offshore/oil & gas
- Water treatment
- Data centers
- Marine
- Renewable energy HVAC

WITH SYSTEM INTEGRATION, YOU GET:

- - ADF Academy

With system integration, your up-front cost is reduced by utilizing our small set of standardized building blocks-making it the most cost-efficient way of integrating ADF Power Tuning into your operation. Additionally, the modularity and flexibility of these building blocks offer unprecedented flexibility and adaptability to any application, from renewable energy production to data centers. This in turn allows you to solve a wide range of problems with a minimal tool set.

 Compensation power ranges from about 70 A to in excess of 10,000 A • Can be controlled via regular HMI-3 devices (basic or extended), via web user interface (WUI), or remote controlled via field bus • Availability in both voltage ranges (< 480 V and 480–690 V)

• A more compact solution than standalone products • Leading ADF technology integrated into your existing products • Fast and simple commissioning with the ADF WUI Dashboard • Access to the ADF System Integration Program training with

Customer cases from around the world

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ADF Power Tuning solutions have been integrated into diverse applications around the world. From data centers in Korea to oil rigs in the Mexican Gulf, see how ADF enhances our customers operations.



Dutch Royal Navy

Marine projects are always demanding due to strict environmental requirements along with complex power grids. Add a highly sophisticated war ship and you have a challenge. Running for several years with traditional static harmonics compensation, one RDN ship began experiencing high harmonics created by the on-board variable frequency drives. ADF Power Tuning with Sensorless Control was retrofitted on board and successfully commissioned during a short trip off the Dutch coast. Due to our extensive experience in the industry and the cost- and space-efficiency of ADF Power Tuning, we have become a key supplier of active filters to the marine industry.

WATER & WASTEWATER TREATMENT Affinity



As pumping stations were upgraded with modernized Struggling with harmonics from welding, robotmotor controlling, the plant's demands on power quality ics, and transportation, the BMW plant needed a increased. Affinity also had a need to meet the powerful solution. Taking care of standard har-G5/4 UK harmonic standard. The ADF Power Tuning monic issues, we have also supported with high frequency challenges as well as resonances - applisystem integration concept came in handy, enabling retrofitting on all sites into the existing infrastructure, cations unique to ADF Power Tuning. minimizing downtime and cost.

"A key part of our decision was the superior efficiency of the active harmonic filters compared to the alternative, active front end drives."



For the full stories and more customer cases, visit ADFPOWERTUNING.COM

Customer cases from around the world

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ADF Power Tuning solutions have been integrated into diverse applications around the world. From data centers in Korea to oil rigs in the Mexican Gulf, see how ADF enhances our customers operations.

GENERAL INDUSTRY Sandvik Mining & **Rock Technology**



requiring an equally dynamic and capable low harmonic solution. While overall Sandvik has experienced improved power quality and productivity, the real showpiece is the enhanced performance of the arc furnace, the power of which increased significantly together with reduced wear and tear.



Marine projects are always demanding due to strict environmental requirements along with complex power grids. Add a highly sophisticated war ship and you have a challenge. Running for several years with traditional static harmonics compensation, one RDN ship began experiencing high harmonics created by the on-board variable frequency drives. ADF Power Tuning with Sensorless Control was retrofitted on board and successfully commissioned during a short trip off the Dutch coast. Due to our extensive experience in the industry and the cost- and space-efficiency of ADF Power Tuning, we have become a key supplier of active filters to the marine industry.

Dutch Royal Navy

Building one of the worlds most advanced X-ray-based research facilities put high requirements on the quality of the supplied power. Early in the project, Comsys was involved as consultants to help design the part of the grid controlling the power quality. Due to tough requirements and an extremely dynamic load, there was only one solution and very few possible suppliers. With this successful installation we have been awarded several other projects on similar sites as well as hospitals, globally.

PARTICLE ACCELERATOR MAX IV Lab



BERTIL LARSSON, MAINTENANCE MANAGER

"Since our relationship with Comsys started it has evolved over the years and we see them as a longterm strategic partner for power quality. To have a stable, reliable product like ADF Power Tuning is one important factor, the other is the The Sandvik operation is dynamic, with high energy demands, competence and know-how that exists within Comsys and its extensive partner network."

DATA CENTERS LSIS

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mented several hundred ADF units in several data involving highly sensitive equipment.

LS Industrial Systems is a Korean powerhouse supply- center projects, ranging from banks to cloud storage ing the industry for more than 40 years. One division facilities. The outstanding performance and extreme under LSIS builds data centers and is today the num- user-friendliness, together with low electrical emisber one engineering, procurement, and construction sions, are the key factors behind choosing ADF Power company in Korea for new builds. LSIS has imple- Tuning technology for this demanding application

When old oil rigs are retrofitted, there can often be increased power quality requirements due to the sensitivity of modern, upgraded equipment. With ADF Power Tuning, the retrofit gets simpler and smaller than conventional or competing technologies.





TECHNICAL SPECIFICATIONS

MODEL	ADF P100-70/480	ADF P100-100/480	ADF P100-130/480
COMPENSATION CURRENT CAPACITY AT 50/60 HZ	70 A _{rms}	100 A _{RMS}	130 A _{rms}
NOMINAL VOLTAGE		208-480 V	
NUMBER OF PHASES		3 phase 3 wire	
HARMONIC CURRENT COMPENSATED		individual compensation up to 49th order	
POWER DISSIPATION	< 1,500 W	< 2,235 W	< 2,970 W
MAXIMUM AIR FLOW		< 600 m³/h	
NOISE LEVEL		< 70 dB(A)	
ENVIRONMENT	0 to 95% RH r	non-condensing, max. altitude 1,000 m w	ithout derating
DIMENSIONS		230 \times 1,790 \times 470 mm (W \times H \times D)	
WEIGHT		145 kg	
PROTECTION CLASS	Standard IP20 acc	ording to IEC 529, optional IP21, other ra	atings upon request

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MODEL	ADF P300-120/480 (ADF P300-90/690)	ADF P300-240/480 (ADF P300-180/690)	ADF P300-360/480 (ADF P300-270/690)	ADF P300-110/480-UL (ADF P300-90/600-UL)
COMPENSATION CURRENT CAPACITY AT 50/60 HZ	120 A _{rms} (90 A _{rms})	240 A _{RMS} (180 A _{RMS})	360 A _{rms} (270 A _{rms})	110 A _{RMS} (90 A _{RMS})
SYSTEM VOLTAGE	480 V (208–48	30 V), 690 V (480–690 V), other	r voltages on request	480 V (208–480 V), 600 V (480–600 V), other
NUMBER OF PHASES		3 ph	ase 3 wire	
HARMONIC CURRENT COMPENSATED		individual compen	sation up to 49th order	
POWER DISSIPATION 480 V (ALT.)	< 2,725 W (690 V: < 2,969 W)	< 5,325 W (690 V: < 5,813 W)	< 7,925 W (690 V: < 8,657 W)	< 2,480 W (600 V: < 2,836 W)
MAXIMUM AIR FLOW	600 m³/h	1,200 m³/h	1,800 m³/h	600 m³/h
NOISE LEVEL		<7	70 dB(A)	
ENVIRONMENT		0 to 95% RH non-condensing, m	ax. altitude 1,000 m without der	rating
DIMENSIONS		800 × 2,155 ×	610 mm (W \times H \times D)	
WEIGHT 480 V (ALT.)	335 kg (690 V: 351 kg)	472 kg (690 V: 495 kg)	609 kg (690 V: 639 kg)	335 kg (600 V: 351 kg)
PROTECTION CLASS	Stan	dard IP21 according to IEC 529,	optional IP43, other ratings upo	on request

ADF P100-90/690		ADF P100	N-100/415		ADF P200-120/480
90 A _{rms}		100	A _{rms}		120 A _{rms}
480-690 V		208-	415 V		208-480 V
3 phase 3 wire		3 phase 4 wire			3 phase 3 wire
individ	ual compensat	tion up to 49th order		C interhar	curve selectable harmonics, monics compensation up to 5 kHz
< 2,969 W		< 2,2	35 W		< 1,200 W
		< 600) m³/h		
	< 70	dB(A)			< 70 dB(A)
	0 to 95%	% RH non-condensing, max	. altitude 1,000 m without	derating	
230	× 1,790 × 47	'0 mm (W \times H \times D)		230	× 1400 × 470 mm (W x H x D)
155 kg		160) kg		90 kg
ADE 0200 220 /400 UI		2200 220 /490 11	DD##200-0-0-4-10	0 /490	DDM200-2 2 4 00 /600
ADF P300-220/480-UL (ADF P300-180/600-UL) 220 A _{RMS} (180 A)	ADF I (ADF I	P300-330/480-UL P300-270/600-UL) 330 A _{RMS} (270 A	PPM300v2-3-A-12 (PPM300v2-3-A-110, 120 A _{RMS} (110 A)	0/480 /480-UL)	PPM300v2-3-A-90/690 (PPM300v2-3-A-90/600-UL) 90 A _{RMS}
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ADF P300-220/480-UL (ADF P300-180/600-UL) 220 A _{RMS} (180 A _{RMS}) 480 V (20 600 V (480 - 600 < 4,835 W (600 V: < 5,547 W)	ADF I (ADF I 08-480 V), V), other on re (60	P300-330/480-UL P300-270/600-UL) 330 A _{RMS} (270 A _{RMS}) equest 3 phase individual compensa < 7,190 W 00 V: < 8,258 W)	PPM300v2-3-A-12 (PPM300v2-3-A-110, 120 A _{RMS} (110 A _{RMS}) 480 V (208–48 e 3 wire tion up to 49th order < 2,725 W	0/480 /480-UL) 0 V)	PPM300v2-3-A-90/690 (PPM300v2-3-A-90/600-UL) 90 A _{RMS} 690 V (480-690 V), 600 V (480-600 V) 600 V (480-600 V) < 2,969 W
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ADF P300-220/480-UL (ADF P300-180/600-UL) 220 A _{RMS} (180 A _{RMS}) 480 V (24 600 V (480-600 480 V (24 600 V (480-600 480 V (24 600 V (480-600 100 V (480-600 100 V (480-600 100 V (480-600) 100 V (480-600 100 V (480-600) 100	ADF 1 (ADF 1 08-480 V), V), other on re (60 0 to 95 10 mm (W × F	P300-330/480-UL P300-270/600-UL) 330 A _{RMS} (270 A _{RMS}) equest 3 phase individual compensat < 7,190 W 1,800 m ³ /h < 70 % RH non-condensing, max 4 × D)	PPM300v2-3-A-12 (PPM300v2-3-A-110, 120 A _{RMS} (110 A _{RMS}) 480 V (208–48) e 3 wire tion up to 49th order < 2,725 W dB(A) . altitude 1,000 m without (230	0/480 /480-UL) 0 V) 600 derating × 1,400 × 47	PPM300v2-3-A-90/690 (PPM300v2-3-A-90/600-UL) 90 A _{RMS} 690 V (480-690 V), 600 V (480-600 V) 600 V (480-600 V)
ADF P300-220/480-UL (ADF P300-180/600-UL) 220 A _{RMS} (180 A _{RMS}) 480 V (24 600 V (480-600 480 - 600 480 - 600 (600 V (480-600 1,200 m³/h 1,200 m³/h 300 × 2,155 × 6 472 kg (600 V : 495 kg)	ADF 1 (ADF 1 08-480 V), V), other on re (60 0 to 95 10 mm (W × F 609 1	P300-330/480-UL P300-270/600-UL) 330 A _{RMS} (270 A _{RMS}) equest 3 phase individual compensa < 7,190 W 1,800 m ³ /h < 70 % RH non-condensing, max H × D) kg (600 V: 639 kg)	PPM300v2-3-A-12 (PPM300v2-3-A-110, 120 A _{RMS} (110 A _{RMS}) 480 V (208–48) e 3 wire tion up to 49th order < 2,725 W dB(A) . altitude 1,000 m without 230 133 kg	0/480 /480-UL) 0 V) 600 derating × 1,400 × 47	PPM300v2-3-A-90/690 (PPM300v2-3-A-90/600-UL) 90 A _{RMS} 690 V (480–690 V), 600 V (480–600 V) 600 V (480–600 V)

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ADF Power Tuning was developed by Comsys AB in Lund, Sweden. Working with their global network of partners, the ADF Partner Network provides active filter solutions for a wide range of applications, enabling businesses to increase productivity, and simultaneously save money while reducing their carbon footprint.

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