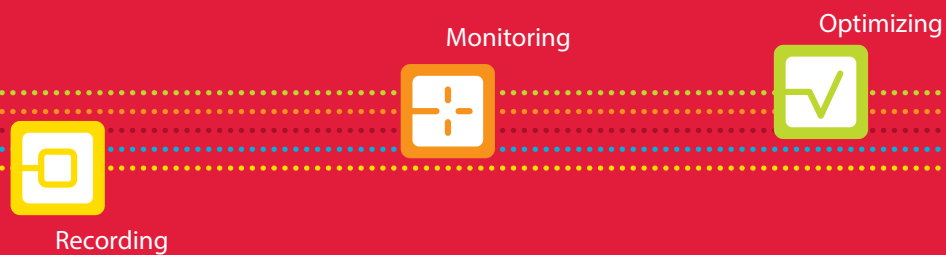


Reactive power controllers



The reactive power controller is the measurement and control unit of reactive power compensation systems.

After calculating the compensation power, they automatically switch capacitor stages on or off in order to reduce the strain on electrical supply installations loaded unnecessarily by inductive or capacitive reactive current, and to reduce reactive consumption costs.



Reactive power controllers

multicomp F144-3

Housing dimensions
(H x W x D in mm)

144 x 144 x 60

Data display

**LCD
illumination**

Interface

Modbus



Single-phase reactive power controller

Highlights

- Detecting and compensating for the missing compensation power in case of recovery into the energy provider network
- Rapid compensation with few switching operations
- Display with two-line LC display, stage status and recovery
- Manual-0-automatic switch separately programmable for each stage
- Integrated temperature measurement
- Interface RS485 for Modbus

An overall view of the **technical details** can be found on pages 22-25.

The microcontroller-controlled **multicomp F144-3** records all network data relevant to the control of small systems via A/D transformer inputs. After calculating the required compensation power to achieve the desired target $\cos \varphi$, the available capacitor stages are automatically switched on or off with a few switching operations. Programming is menu-

assisted and is performed with two buttons. System-specific values are stored in a non-volatile memory. Each stage can be switched individually via the built-in manual-0-automatic function.

multicomp F144-3Ph-3

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Housing dimensions (H x W x D in mm) **144 x 144 x 68**

Data display **LCD illumination**

Interface **KBR eBus Modbus**



3-phase reactive power controller

Highlights

- Detecting and compensating for the missing compensation power in case of recovery into the energy provider network
- 18 stages for single-phase and/or 3-phase compensation
- Limit monitoring function for the protection of capacitors from overvoltage and excessive harmonic load
- Integrated temperature measurement input for monitoring the ambient temperature and for switching on fans
- Illuminated graphic display 128 x 96 pixels with dimming function

The **multicomp F144-3Ph-3** reactive power controller works automatically in 4-quadrant operation (generator operation), i.e. even during energy recovery to the energy provider network, missing compensation power is easily detected and compensated. Through the integrated temperature measurement input, the ambient temperature in the reactive power compensation system is also monitored and if a predefined

limit temperature is exceeded, the fan is switched on. The 3-phase voltage and current recording makes it possible to not only realize 3-phase compensation as before, but also single-phase compensation or a mixture of single-phase and 3-phase compensation. Of course the device has also an interface RS485 for eBus or Modbus. Available display language in DE/EN or EN/CN.

Reactive power controllers

multicomp D6



4-quadrant reactive power controller

Highlights

- Detecting and compensating for the missing compensation power in case of recovery into the energy provider network
- Network analysis and limit value monitoring function for the protection of capacitors from overvoltage, overcurrent and excessive harmonic load.
- Integrated temperature measurement input for monitoring the ambient temperature and for switching on fans
- Modular up to 24 stages
- Can be expanded by the secureC safety and maintenance module

An overview of the **technical details** is given on pages 22-25.

The **multicomp D6** reactive power controller works automatically in 4-quadrant operation (generator operation), i.e. even during energy recovery to the energy provider network, missing compensation power is easily detected and compensated. Through the integrated temperature measurement input, the ambient temperature in the reactive power compensation system is also monitored and if a predefined

limit temperature is exceeded, the fan is switched on. The multicomp F96 also has an interface for connection to the KBR eBus, whereby all settings can be conveniently carried out from the PC (without the display module). In addition, the bus communication can be switched from KBR eBus to Modbus RTU/ASCII.



multicomp F96
Display module



multisio D2-4RO
Relay module



multisio D2-1T12RO
Temperature and fan module



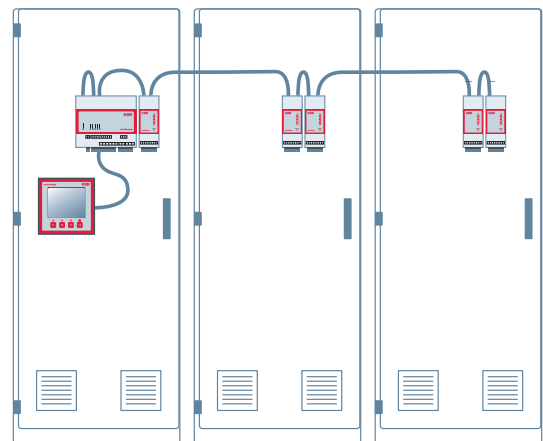
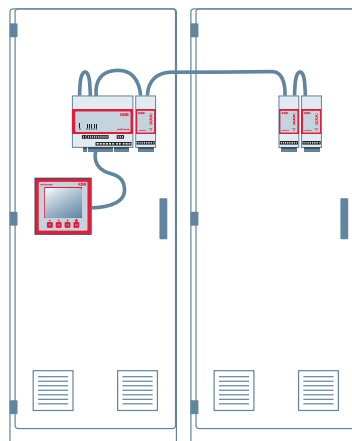
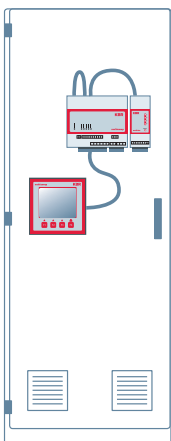
multimes D4
measuring module

Temperature management

Conventional reactive power controllers simply switch off the system when they reach a limit temperature.

The consequences: Reactive current costs, high apparent current and the triggering of switches. The temperature management can avoid this to a great extent.

- Simple connection of expansion systems thanks to ribbon and bus technology
- Minimal wiring required
- Each system cabinet can be controlled and monitored separately (control by ventilation, temperature measurement, safety shutdown)
- Can be expanded with the KBR safety concept



Control cabinet		Control and expansion cabinet		Control cabinet and 2 expansion cabinets		
400/16	400/8	400/4	400/16	400/4	400/4	
2 x 25, 3 x 50, 2 x 100 kvar	4 x 50, 2 x 100 kvar	4 x 100 kvar	4 x 50, 2 x 100 kvar	4 x 100 kvar	4 x 100 kvar	
1 x multicomp F96 1 x D2-4RO	1 x multicomp F96 1 x D2-4RO	1 x D2-4RO 1 x D2-1T12RO	1 x multicomp F96 1 x D2-4RO	1 x D2-4RO 1 x D2-1T12RO	1 x D2-4RO 1 x D2-1T12RO	



		DEVICE TYPE	multicomp F144-3 [1] F144-MS-1V1C1T16RO [2] F144-MS-1V1C1T12RO [3] F144-MS-1V1C1T16DO [4] F144-MS-1V1C1T12DO [5] F144-MS-1V1C1T1D06RO
SWITCHING STAGES	Relay outputs; 250 VA per output; 250 V AC: 50/60 Hz		[1] 6 [2] 12 [3] 6 optocoupler outputs [4] 12 optocoupler outputs [5] 6 relay and 6 optocoupler outputs
	Power per stage [kvar] programmable		0 to 999.9 kVar cap.
	Discharge times programmable		0 ... 900 sec.
	Manual-0 automatic switch Status display		■ ■
	Learning function for automatic programming by induced current measurement (requirement: transformer fitted into the cable to the compensation unit)		via main current transformer
	Rotary field and phase allocation programmable		■ ■
SWITCHING PERFORMANCE	Self-optimizing Circular switching of equal stages		■ –
	Special switching functions for		Multiple series connection
	Switch-off limit for low load operation		programmable
MONITORING FUNCTIONS	Zero-voltage trigger		■
	Overcurrent switch-off (only in connection with induced current measurement)		–
	Overvoltage switch-off		fixed
	Temperature measurement and monitoring with fan control and emergency shut-down		■
	Harmonics monitoring with alarm message and emergency shut-down additional displays		■ Voltage: KF – U, 3rd – 13th harmonic
	Error messages programmable		■
	Target cos φ monitoring; alarm if unreachable		■
	Switching operation monitoring with display per stage		■
	Controller status display (overcompensation/ undercompensation)		■
SPECIAL OPERATING MODE	Thyristor fast circuit breaker (optocoupler outputs)		[3], [4], [5]
	Single-phase compensation		–
DISPLAYS	Display type		LCD (two-line)
	Measuring parameters (RMS values RMS)		$U_{PH-N}, U_{PH-PH}, \cos \varphi, f_{network}, I_{main}, S_{total}, Q_{total}, P_{total}, Q_{total\ demand}, temp.$
	Operating time display		–
MEASUREMENT	Measurement accuracy: Voltage current power		0.5% 0.5% 1%
	Update speed		20 ms
	Single-phase measurement (4Q)		Phase-phase or phase-neutral
	3-phase measurement		–

■ Standard version – Not available

Reactive power controllers



	multicom F144-3Ph-3 F144-3Ph-ESMS-3V3C1T11DI20RO	multicom D6, multicom F96-DS D6-ESMSBDS-1-1V1C6RO	Relay module multisio D2-4RO	Temperature and fan module multisio D2-1TI2RO	Measuring module multimes D4
	18	Modular 4 – 24	4	2	–
	0 to 9999.9 kVar ind. or cap.	0 to 999.9 kVar ind. or cap.	–	–	–
	10 ms to 999.99 sec.	0 ... 900 sec.	–	–	–
	■ ■	■ ■	– –	– –	– –
	–	in connection with multimes D4 using induced current transformers	–	–	–
	■ ■	■ ■	– –	– –	– –
	■ –	■ ■	– –	– –	– –
	Multiple series connection	Combination filter	–	–	–
	programmable	fixed	–	–	–
	■	■	–	–	–
	–	■ in connection with multimes D4	–	–	–
	programmable	programmable	–	–	–
	■	■	–	■	–
	■ Voltage: KF – U, 3rd – 19th harmonic	■ Voltage: KF – U; 3rd – 19th harmonic	–	–	–
	■	■	–	–	–
	■	■	–	–	–
	■	■	–	–	–
	■	■	–	–	–
	–	–	–	–	–
	■	–	–	–	–
	LCD (dot matrix 128 x 96)	LCD (dot matrix 128 x 96)	LED Status indicator	LED Status indicator	LED Status indicator
	U_{PH-N} , U_{PH-PH} , I_{main} , $\cos \phi$, $f_{network}$, $S-P-Q$, $S-P-Q_{total}$, Q_{total} demand, temp.	U_{L-N} or U_{L-L} , $\cos \phi$, $f_{network}$, I_{main} , $I_{induced}$, P_{total} , Q_{total} demand, temp.	–	–	–
	■	■	–	–	–
	0.5% 0.5% 1%	0.5% 0.5% 1%	–	–	0.5% 0.5% 1%
	20 ms	~ 300 ms	–	–	< 1 Sec.
	Phase-neutral	Phase-phase or phase-neutral	–	–	Phase-neutral
	3 x phase-neutral	–	–	–	3 x phase-neutral

Version: June 2017. Subject to change.

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		DEVICE TYPE	multicomp F144
			[1] F144-MS-1V1C1TI6RO [2] F144-MS-1V1C1TI12RO [3] F144-MS-1V1C1TI6DO [4] F144-MS-1V1C1TI12DO [5] F144-MS-1V1C1TIDO6RO
MEMORY	Long-term memory		–
PASSWORD PROTECTION	With digit code		■
INPUTS	Voltage path	Low-voltage; direct measurement	30 V ... 690 V ... 790 V AC 50/60 Hz
		Medium voltage	1 V ... 99.9 kV programmable
	Current path	Main current transformer	1 x 0.15 A ... 5 A ... 6 A AC
		Induced current transformer	–
	Frequency range		40 to 70 Hz
	2. Target value $\cos \varphi 2$	Automatic switchover in case of energy recovery	– to $\cos \varphi = 1$
OUTPUTS	Additional relay outputs Error message relay / fan relay		Stage relay/fan relay Error message relay
INTERFACES	Serial interface with KBR eBus protocol Modbus		– Modbus RTU
POWER SUPPLY	Operating voltage		85 – 265 V AC/DC
	Frequency		50/60 Hz
	Power consumption		max. 15 VA, 9 W
DIMENSIONS	Switchboard installation	Housing (H x W x D) Switchboard cutout (H x W)	144 x 144 x 60 mm 138 x 138 mm
	DIN rail installation	Housing (H x W x D)	

***4-quadrant operation:** As energy costs are becoming increasingly important economically, more and more distributed power generation plants will be set up. During low-load periods, this can result in energy being fed back into the supply network. Therefore, all possible states concerning consumption and the provision of active and reactive power must be taken into account for the control system. For example, if asynchronous generators are used to generate energy, active power may be fed into the supply network and reactive power taken from the supply network.

Reactive power controllers



	multicom F144-3Ph F144-3Ph-ESMS-3V3C1T1DI20RO	multicom D6, multicom F96-DS D6-ESMSBDS-1-1V1C6RO	Relay module multisio D2-4RO	Temperature and fan module multisio D2-1T12RO	Measuring module multimes D4
	–	for events and error messages; battery-buffered with timestamp	–	–	–
	■	■	–	–	–
	3-phase / single-phase 25 V ... 230 V ... 280 V AC 50/60Hz	1 x 100 V ... 500 V ... 600 V AC 50/60Hz	–	–	3x 30-280 V AC, Ph-N
	1 V ... 999.9 kV programmable	0.01 kV ... 30 kV programmable	–	–	–
	3-phase / single-phase 0.03 A ... 5 A ... 6 A AC	1 x 0.01 A ... 1 A ... 1.2 A AC and 1 x 0.05 A ... 5 A ... 6 A AC	–	–	3x 0,02 A... 5A... 6 A AC
	–	via multimes D4	–	–	–
	40 to 62 Hz	40 – 70 Hz	–	–	50/60 Hz
	■ ■, value programmable	– automatic switchover in case of energy recovery to $\cos \varphi^2$, value freely programmable	– –	– –	– –
	■ ■	■ ■	4x Stage relay	Fan relay Alarm relay	–
	eBus, Modbus RTU	eBus Modbus RTU/ASCII	Modulebus	Modulebus	Modulebus
	85 - 265 V AC/DC	85 V – 265V AC/DC	24 V DC via Modulebus	24 V DC via Modulebus	50 - 32810 V AC Phase-neutral
	50/60 Hz	50/60 Hz	–	–	50/60 Hz
	max. 5 - 15 VA / 9 W	15 VA	1 W	1,3 W	Power supply 3,2 VA Modulebus 0,3 W
	144 x 144 x 78 138 x 138 mm	96 x 96 mm, display multicom F96 LCD 92 x 92 mm, display multicom F96 LCD	–	–	–
		90 x 1068 x 61 mm, multicom D6	90 x 36 x 61 mm	90 x 36 x 61 mm	90 x 72 x 61 mm

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