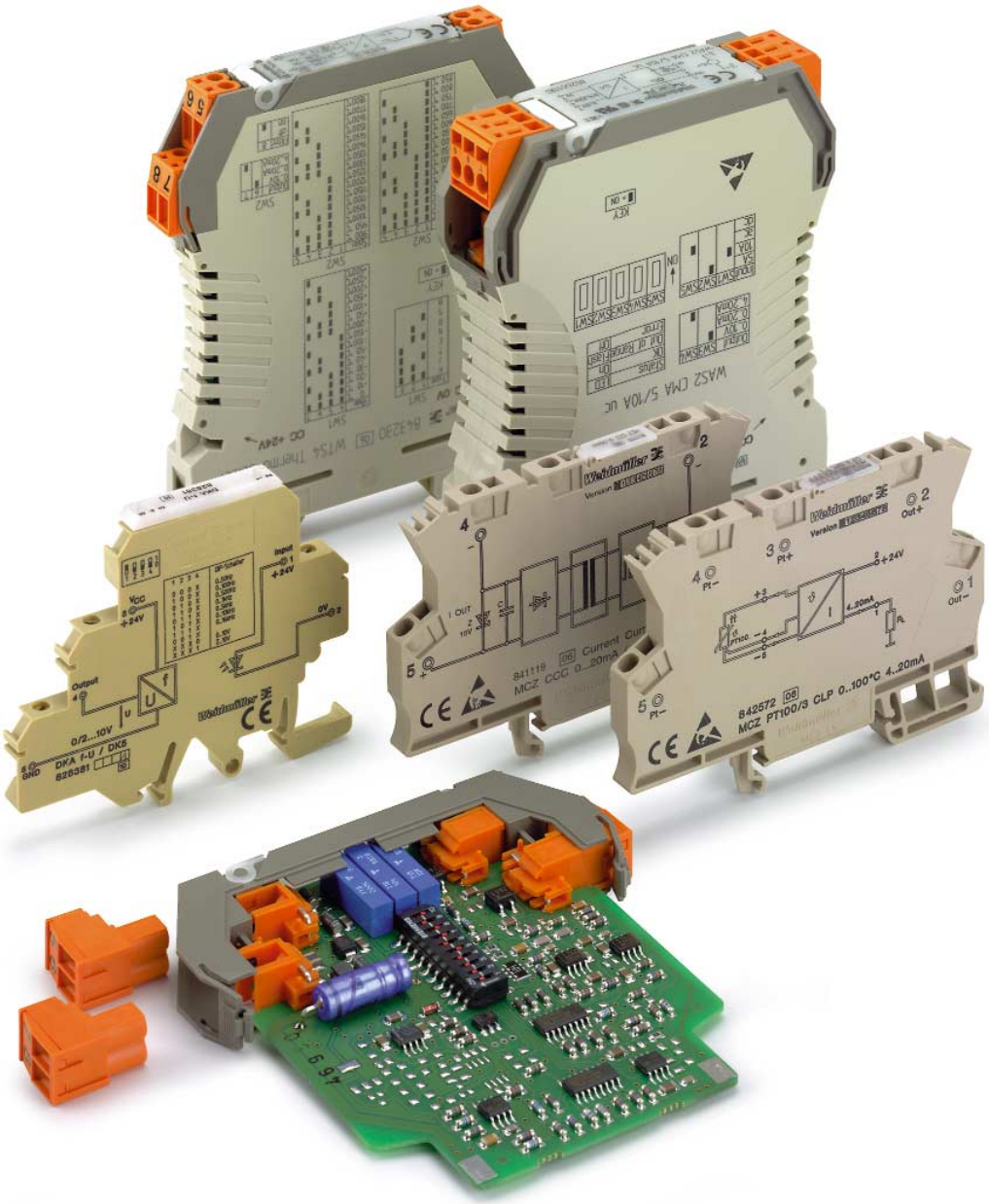

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The problem

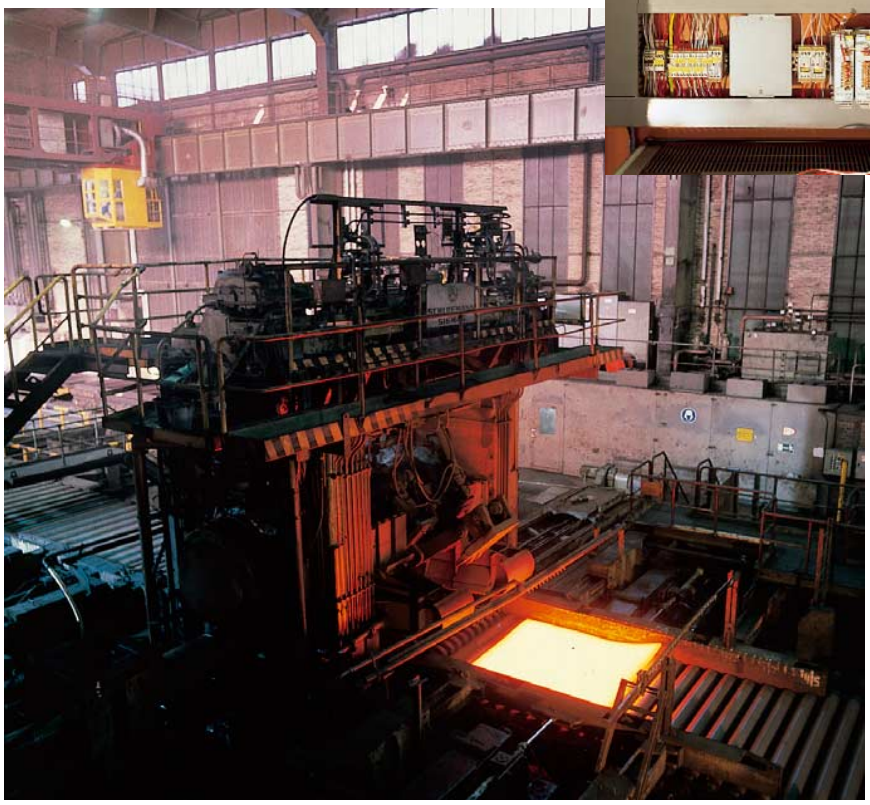
The real world can be measured in many ways, for example, via temperature, humidity, air pressure and so forth.
The parameters of these different physical qualities change continuously. Elements that monitor statuses and changes in statuses of a given environment, must reflect these continual changes.
Within the framework of industrial monitoring tasks, the statuses of an environment are monitored by using sensors. These sensors should provide signals that enable connected evaluating and monitoring installations to draw detailed conclusions concerning the status of, for example, a production process. The sensor signals trace the continuous changes in the monitored range. The signals can be in analogue or digital form; which means in normal cases, an electrical voltage or current value is produced that corresponds proportionally to the monitored physical quantities. Increasing automation with the intention of achieving or maintaining certain predetermined statuses makes the processing of analogue values increasingly important. This is also true of fields beyond those where this has been necessary and standard for a long time, for example, processing technology in the chemical industry. Standard electrical signal values are the norm within the framework of this processing technology.
Current values from 0...20 mA, 4...20 mA or voltage values from 0...10 V have been introduced as sensor output values for differing physical quantities. Weidmüller has taken account the need for increasing automation with the processing of these analogue signals, and offers a wide range of products that are designed for handling sensor signals.
This means, units are made available for standard signals (0...20 mA, 4...20 mA, 0...10 V) that generate output signal values proportional to the variable input signals, and at the same time enable the safe separation of, for example, sensor circuits of an evaluation circuit. This safe separation is particularly important to avoid mutual interference of multiple sensor circuits, for example, ground loops in interlinked measurement circuits. The wide range of products includes all functions for converting separation and monitoring signals. The different designs in connection with the respective functions cover practically all applications in industrial measurement technology.
With these new products, Weidmüller offers the possibility of taking into account the demands of modern automation technology with the inclusion of analogue signals. These products guarantee an elementary function between signals from the field and the further processing systems. The mechanical characteristics of these products correspond to those of the well-known Weidmüller products and are part of a continuous, ongoing concept. The signal conditioners can be combined together with other Weidmüller products.
They have been electrically and mechanically designed to ensure that only a minimum of wiring and maintenance costs are necessary.

The product program

contains the following functions:

- Current transformer
- Voltage transformer
- Thermocouple conditioners for resistance thermometers
- Frequency signal conditioner
- Potentiometer conditioner
- AC signal conditioner
- Bridge measurement conditioner
- Limit value monitoring modules
- AD/DA converter

These products are categorised according to functionality as pure signal conversion, 2-way-isolation, 3-way-isolation and as passive separation.



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Analogue Signal Processing

2-way-isolation separates the signals galvanically and decouples the measurement circuits. In so doing it eliminates potential differences caused by long cable lengths and common reference points. Furthermore, the galvanic isolation offers protection against destruction by overvoltage, and against inductive and capacitive interferences.

3-way-isolation also decouples the supply voltage from the input and output circuits, and enables the function with only one operating voltage.

The **passive isolator** offers a further elementary advantage; it needs no additional voltage supply. The supply to the modules ensues via the input circuit and is the transferred to the output. This current loop supply is distinguished by very low power consumption.

There are a large number of products available for measuring temperatures. RTD **PT100** signals, in 2-, 3- and 4-wire technology, are converted to standardised 0 – 20 mA, 4 – 20 mA and 0 – 10 V signals.

The modules which can be connected to commercially available **thermocouples** have cold junction compensation as standard. Furthermore, the modules amplify and linearize the voltage signals from the thermocouple. This guarantees an exact conditioning of analogue signals by eliminating sources of interference and errors.

Frequency converters convert frequencies to standard analogue signals. This enables controllers connected in series to directly process impulse trains when making speed or rotational speed measurements.

It is inconceivable to think about automation without **analogue-digital-analogue converters**. To bring together the aforementioned analogue form of describing the environment and the customary digital processing, within the framework of process monitoring, it is necessary to convert analogue signals into digital signals. Weidmüller offers modules for the following standard input and output signals: 0...20 mA, 4...20 mA and 0...10 V. 8-bit and 12-bit digital modules are available. All modules have an added input for making instantaneous measurements.

Current monitoring modules enable the monitoring of current values up to 60 A in alternating or direct voltages. Over range or under range values trip the switching output. Modules with analogue outputs enable the continuous monitoring of currents via connected controls.

Voltage monitoring modules can be used to monitor direct and alternating voltages. Voltage fluctuations, resulting from switching operations or network overloads, can be reliably recognised and reported via the adjustable threshold function.

Modules for **monitoring of revolutions and torque** enable the control of cyclic movements on conveyor belts, ventilators and pumps. The output responds after a set amount of time, should the expected impulse not be received. The reliable potential-free relay contact, signalises the interference to the responsible component group.

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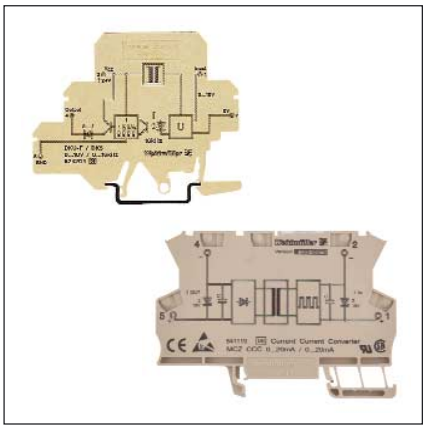
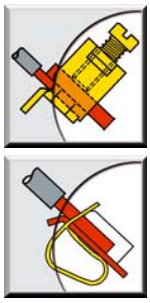
Mini Coupler / Mini Conditioner



DK Mini Coupler / MCZ Mini Conditioner

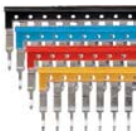
- Extensive range of electronic functions in terminal format
- Pluggable cross-connections with mini conditioners
- Mini couplers with screw-in cross-connection combs
- Mini couplers with screw connections
- Mini conditioners with tension clamp connections

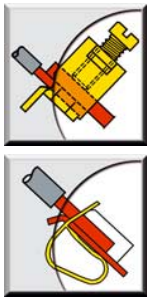


WAVESERIES

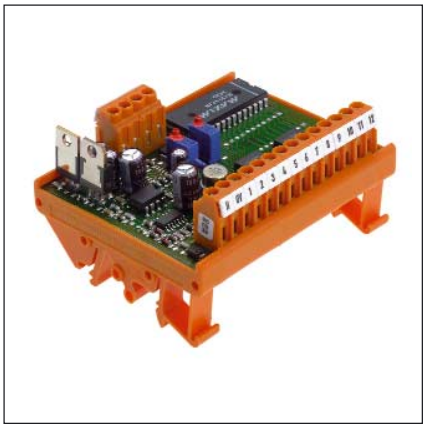
WAVEANALOG / WAVEANALOG PRO / WAVECONTROL

- Pluggable PCB for fast service when the configuration is changed
- Pluggable cross-connection in base socket housing to distribute the power supply, marking (CC) in the block diagram on the head plate
- Pluggable connections with optional screw or tension clamp connection





RS profiles



Analog-/Digital-Converters

- Mounts onto TS 32 and TS 35 mounting rails
- Open, cost-saving design
- Variable housing width

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Selection Table of Functions

Function	Areas of application	Description	Versions	Page
DC signal conditioners	Signal conditioning, signal isolation, suppression of mass loops	DC input/fixed functions and configurable inputs and outputs	MCZ WAVEANALOG WAVEANALOG PRO	164 174-184 185
	Motor current limitation, pressure alarm, direct disconnection of connected modules, safety function	DC input/limit value monitoring	DK MCZ	172 173
PT100 signal conditioners	Temperature monitoring, noise rejection, electrical decoupling of visualization devices, suppression of mass loops, heating and cooling monitoring, overheating protection of motors	RTD input/fixed functions and configurable inputs and outputs	MCZ WAVEANALOG WAVEANALOG PRO	165 186-188 189
Thermocouple conditioners	Temperature monitoring, noise rejection, electrical decoupling of visualization devices, suppression of mass loops, heating and cooling monitoring, overheating protection of motors	Thermo input/fixed functions and configurable inputs and outputs	WAVEANALOG WAVEANALOG PRO	190 191
Frequency signal conditioners	Flow rate measurements, frequency converter monitoring, speed measurements, pulse processing	Input/fixed functions and configurable inputs and outputs	DK MCZ	167-168 166
AD/DA converters	Conditioning of voltage and current signals in 8-bit/12-bit digital form	8-bit AD/DA converter 12-bit AD/DA converter	RS	210-213
Current monitoring	Motor current monitoring, emergency lighting monitoring	AC input/measuring of sinusoidal and non sinusoidal signals up to 60A	DKI WAVECONTROL SMSI	172 196-199 200-203
Voltage monitoring	Under and overvoltage monitoring, operating status indication	One and three-phase overvoltage	SMSU	204-205
Motion and rotational speed monitoring	Downtime monitoring, conveyor-drive monitoring, monitoring of fans, pumps or pistons	PNP/NPN or NAMUR input/switching output	DKLW SMS	169 206
Namur switching amplifier	Switching amplifier	Namur input/switching output	EGV	207
Setpoint device	Testing measuring distances, defined input of analogue values	1 control input/+/-set value/ analogue output	EMA/SW24	208

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Selection Table

Function	Input	Output	Galvanic isolation	Voltage supply	Setting	Module width/mm	Connection type	Cat. No.	Page
DC/DC	0…20mA	0…20mA	yes	Without auxiliary pwr. current loop supply from input	Fixed	6	Tens. clamp	**8411190000**	164
	0…20mA	0…20mA	yes	Without auxiliary pwr. current loop supply from input	Fixed	17.5	Screw/ tens. clamp	**8444950000/ 8444960000** (1-channel)	174
	0…20mA	0…20mA	yes	Without auxiliary pwr. current loop supply from input	Fixed	17.5	Screw/ tens. clamp	**8463580000/ 8463590000** (2-channel)	174
	0…20mA	0…20mA	2-way	19.2…28.8Vdc/ Voltage supply of both sides	Fixed	12.5	Screw/ tens. clamp	**8445070000/ 8445080000**	176
	0…20mA	0…20mA	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540180000/ 8540190000**	178
	0…20mA	0…20mA	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447160000/ 8447170000**	181
	0…20mA	4…20mA	2-way	19.2…28.8Vdc/ Voltage supply of both sides	Fixed	12.5	Screw/ tens. clamp	**8446970000/ 8446990000**	176
	0…20mA	4…20mA	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540250000/ 8540260000**	181
	0…20mA	4…20mA	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447190000/ 8447200000**	181
	0…20mA	0…10V	2-way	19.2…28.8Vdc/ Voltage supply of both sides	Fixed	12.5	Screw/ tens. clamp	**8447020000/ 8447030000**	176
	0…20mA	0…10V	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540270000/ 8540280000**	178
	0…20mA	0…10V	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447220000/ 8447230000**	181
	4…20mA	0…20mA	2-way	19.2…28.8Vdc/ Voltage supply of output side	Fixed	12.5	Screw/ tens. clamp	**8444980000/ 8444990000**	175
	4…20mA	0…20mA	yes	18…30Vdc	Fixed/10 kHz	17.5	Screw/ tens. clamp	**8540200000/ 8540210000**	179
	4…20mA	0…20mA	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447250000/ 8447260000**	182
	4…20mA	4…20mA	2-way	19.2…28.8Vdc/ Voltage supply of output side	Fixed	12.5	Screw/ tens. clamp	**8445010000/ 8445020000**	175
	4…20mA	4…20mA	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540180000/ 8540190000**	178
	4…20mA	4…20mA	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447160000/ 8447170000**	182
	4…20mA	0…10V	2-way	19.2…28.8Vdc/ Voltage supply of output side	Fixed	12.5	Screw/ tens. clamp	**8445040000/ 8445050000**	175
	4…20mA	0…10V	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540230000/ 8540240000**	179
	4…20mA	0…10V	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447280000/ 8447290000**	182
	0…10V	0…20mA	2-way	19.2…28.8Vdc/ Voltage supply of both sides	Fixed	12.5	Screw/ tens. clamp	**8447050000/ 8447080000**	177
	0…10V	0…20mA	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540310000/ 8540320000**	180
	0…10V	0…20mA	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447310000/ 8447320000**	183
	0…10V	4…20mA	2-way	19.2…28.8V/ Voltage supply of both sides	Fixed	12.5	Screw/ tens. clamp	**8447100000/ 8447110000**	177
	0…10V	4…20mA	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540290000/ 8540300000**	180
	0…10V	4…20mA	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447340000/ 8447350000**	183
	0…10V	0…10V	2-way	19.2…28.8Vdc/ Voltage supply of both sides	Fixed	12.5	Screw/ tens. clamp	**8447130000/ 8447140000**	177

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Selection Table

Function	Input	Output	Galvanic isolation	Voltage supply	Setting	Module width/mm	Connection type	Cat. No.	Page
	0…10V	0…10V	yes	18…30Vdc	Fixed/10 Hz	17.5	Screw/ tens. clamp	**8540330000/ 8540340000**	180
	0…10V	0…10V	3-way	18…30Vdc	Fixed/20 kHz	17.5	Screw/ tens. clamp	**8447370000/ 8447380000**	184
	Variable voltage and current (+/-20mV...+/-200V, +/-0.1mA...+/-100mA)	Variable voltage and current (-10V…+10V, -20mA…+20mA)	yes	20…253Vdc	DIP switch Potentiometer	12.5	Screw/ tens. clamp	**8560740000/ 8560750000**	185
	PT100/	(4)…20mA	no	19.2…28.8Vdc	DIP switch	12.5	Screw/ tens. clamp	**8432210000/ 8432220000**	186
RTD/DC	PT100/ 2-wire	0…10V	no	19.2…28.8Vdc	DIP switch Potentiometer	12.5	Screw/ tens. clamp	**8432180000/ 8432190000**	186
	PT100/ 2-wire	4…20mA	no	current loop supply in output	Fixed	6	Tens. clamp	**8425720000**	165
	PT100/ 3-wire	0(4)…20mA	no	19.2…28.8Vdc	DIP switch Potentiometer	12.5	Screw/ tens. clamp	**8432150000/ 8432160000**	187
	PT100/ 3-wire	0…10V	no	19.2…28.8Vdc	DIP switch Potentiometer	12.5	Screw/ tens. clamp	**8432090000/ 8432130000**	187
	PT100/0 4-wire	(4)…20mA	no	19.2…28.8Vdc	DIP switch Potentiometer	12.5	Screw/ tens. clamp	**8432270000/ 8432280000**	188
	PT100/ 4-wire	0…10V	no	19.2…28.8Vdc	DIP switch Potentiometer	12.5	Screw/ tens. clamp	**8432240000/ 8432250000**	188
	PT100/ 2-/3-/4-conduct. Ni100 Potentiometer: min. 0…100Ω max. 0…100kΩ R: 0…450Ω	0…10V 0…20mA 4…20mA	yes	18…30Vdc	DIP switch Potentiometer	17.5	Screw/ tens. clamp	**8560700000/ 8560710000**	189
Thermo/DC	K, J, T, E, N, R, S, B								
	Thermo K, J, T, E, N, R, S, B	0…10V 0…20mA 4…20mA	no	19.2…28.8Vdc	DIP switch	12.5	Screw/ tens. clamp	**8432300000/ 8432310000**	190
	Thermocouples K, J, T, E, N, R, S, B	0…10V 0…20mA 4…20mA	yes	18…30Vdc	DIP switch Potentiometer	17.5	Screw/ tens. clamp	**8560720000/ 8560730000**	191
Frequency/DC	0...50/100/500Hz 0...1/5/10/16kHz	0(4)…20mA	no	21.6…26.4Vdc	DIP switch	6	Screw	**8311870001**	168
	0...50/100/500Hz 0...1/5/10/16kHz	0(4)…20mA	no	21.6…26.4Vdc	DIP switch	6	Screw	**8311870001**	168
	0...50/100/500Hz 0...1/5/10/16kHz	0…10V	no	21.6…26.4Vdc	DIP switch	6	Screw	**8283810000**	168
	0…20mA	0...1/5/10/16kHz	no	21.6…26.4Vdc	DIP switch	6	Screw	**8258870000**	167
	0…20mA	0...1/5/10/16kHz	no	21.6…26.4Vdc	DIP switch	6	Tens. clamp	**8461480000**	166
	4…20mA	0...1/5/10/16kHz	no	current loop supply in input	DIP switch	6	Screw	**8081330000**	167
	4…20mA	0...1/5/10/16kHz	no	current loop supply in input	DIP switch	6	Tens. clamp	**8461490000**	166
	0…10V	0...1/5/10/16kHz	no	21.6…26.4Vdc	DIP switch	6	Screw	**8242040000**	167
	0…10V	0...1/5/10/16kHz	no	21.6…26.4Vdc	DIP switch	6	Tens. clamp	**8461470000**	166
	Variable, programmable	Switching output PNP	no	19.2…28.8Vdc	Fixed	12	Screw	**8248340000**	170-171
Limit value monitoring	0…20mA	Switching output PNP 2-channel	no	19.2…28.8Vdc	Potentiometer	6	Screw	**8031320000**	172
	0…20mA	Switching output PNP 2-channel	no	19.2…28.8Vdc	Potentiometer	6	Tens. clamp	**8227350000**	173
	0…10V	Switching output PNP 2-channel	no	19.2…28.8Vdc	DIP switch Potentiometer	6	Screw	**8019640000**	172
	0…10V	Switching output PNP 2-channel	no	19.2…28.8Vdc	DIP switch Potentiometer	6	Tens. clamp	**8260280000**	173
AD convert.	0…20mA	8-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1160561001**	210
	4…20mA	8-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1168561001**	210
	0…10V	8-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1160361001**	210
		8-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1122361001**	210
	0…20mA	12-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1168461001**	212
	4…20mA	12-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1169161001**	212
	0…10V	12-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1168361001**	212
		12-bit	no	19.2…28.8Vdc	Fixed	70	Screw	**1168261001**	212

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Selection Table

Function	Input	Output	Galvanic isolation	Voltage supply	Setting	Module width/mm	Connection type	Cat. No.	Page
DA convert.	8-bit	0…20mA	no	19.2…28.8Vdc	Fixed	70	Screw	**1165860000**	211
	8-bit	4…20mA	no	19.2…28.8Vdc	Fixed	70	Screw	**1169260000**	211
	8-bit	0…10V	no	19.2…28.8Vdc	Fixed	70	Screw	**1160760000**	211
	8-bit		no	19.2…28.8Vdc	Fixed	70	Screw	**1123360000**	211
	12-bit	0…20mA	no	19.2…28.8Vdc	Fixed	70	Screw	**1166060000**	213
	12-bit	4…20mA	no	19.2…28.8Vdc	Fixed	70	Screw	**1165960000**	213
	12-bit	0…10V	no	19.2…28.8Vdc	Fixed	70	Screw	**1166160000**	213
	12-bit		no	19.2…28.8Vdc	Fixed	70	Screw	**1160860000**	213
Current monitoring	0…1/5/10 Aac	1)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Screw	**8516560000**	196
	0…1/5/10 Aac	1)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Tens. clamp	**8516570000**	196
	0…20/40/60 Aac	1)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Screw	**8513340000**	196
	0…20/40/60 Aac	1)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Tens. clamp	**8526600000**	196
	0…1/5/10 Aac	2)	2-way	21.6…26.4Vdc	DIP switch	22.5	Screw	**8523400000**	197
	0…1/5/10 Aac	2)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Tens. clamp	**8523410000**	197
	0…1/5/10 Aac	3)	2-way	12…30Vdc	DIP sw./P*	22.5	Screw	**8528650000**	197
	0…1/5/10 Aac	3)	2-way	12…30Vdc	DIP sw./P*	22.5	Tens. clamp	**8528660000**	197
	0…5/10 Aac	4)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Screw	**8526610000**	198
	0…5/10 Aac	4)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Tens. clamp	**8526620000**	198
	0…20/25/30 Aac	4)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Screw	**8545830000**	198
	0…20/25/30 Aac	4)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Tens. clamp	**8545840000**	198
	0…20/40/60 Aac	4)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Screw	**8513330000**	199
	0…20/40/60 Aac	4)	2-way	21.6…26.4Vdc	DIP sw./P*	22.5	Tens. clamp	**8526590000**	199
	0.1…2A	Switching output PNP	no	18…30Vdc	Fixed	6	Screw		
	1…50mAdc	Opto-coupler	yes	10…250Vdc	Op. point	22.5	Screw	**1157160000**	200
	40…250mAdc	Opto-coupler	yes	10…250Vdc	Op. point	22.5	Screw	**1156360000**	200
	40…250mAdc	Opto-coupler	yes	10…250Vdc	Op. point	22.5	Screw	**1156460000**	201
	0.2…2.2Aac	Opto-coupler	yes	10…250Vdc	Op. point	22.5	Screw	**1157360000**	201
	1…5Aac	21.6…26.4Vuc	yes	10…250Vdc	Fixed	22.5	Screw	**1112160000**	201
	1…5Aac	5…48Vdc	yes	10…250Vdc	Fixed	22.5	Screw	**8026930000**	201
	1…5Aac	LED	yes	10…250Vdc	Fixed	22.5	Screw	**1112060000**	201
	40...250mAdc	NO 1-channel	yes	10…250Vdc	Op. point	22.5	Screw	**1156660000**	202
	40...250mAdc	NO 1-channel	yes	10…250Vdc	Op. point	22.5	Screw	**1159960000**	202
	0.2...2.2Aac	NO 1-channel	yes	10…250Vdc	Op. point	22.5	Screw	**1156960000**	203
	1…5Aac	NO 1-channel	yes	10…250Vdc	Fixed	22.5	Screw	**1112260000**	203
Voltage monitoring	1-24Vdc	CO 1-channel	yes	21.6…26.4Vuc	Op. point	22.5	Screw	**0555060000**	205
	1-230Vuc	CO 1-channel	yes	207…253Vac	Op. point	22.5	Screw	**0555160000**	205
	18…24Vac	CO 1-channel	yes	18…27Vac	Op. point	22.5	Screw	**1156760000**	204
	36…48Vac	CO 1-channel	yes	36…53Vac	Op. point	22.5	Screw	**1157660000**	204
	83…110Vac	CO 1-channel	yes	83…121Vac	Op. point	22.5	Screw	**1157760000**	205
	165…220Vac	CO 1-channel	yes	165…253Vac	Op. point	22.5	Screw	**1157860000**	205
	200…260Vac	NO 1-channel	yes	200…299Vac	Op. point	22.5	Screw	**1160160000**	205
	3 phase 165...230Vac	NO 2-channel	yes	165…230Vac	Op. point	22.5	Screw	**1156560000**	205
	3 phase 165...230Vac	NO/NC	yes	165…230Vac	Op. point	22.5	Screw	**1178760000**	205
Rotational-motion and r.p.m. monitoring	P. / N. switching 24Vdc	CO 1-channel	no	195.5…241.5Vac	Potentiometer	22.5	Screw	**1110560000**	206
Namur switch amplifier	Namur	NO 1-channel	no	21.6…26.4Vdc	no	22.5	Screw	**1120360000**	207
	Namur	PNP/NPN	no	21.6…26.4Vdc	no	22.5	Screw	**1122460000**	207
Setpoint device	0…24V	10.5…+10.5V	yes	21.6…26.4Vdc	Potentiometer	22.5	Screw	**1172660000**	208

1) Switch output / 1 changeover contact
2) 0…10 V, 0 (4)…20 mA switchable
3) 4…20 mA / current loop supply
4) Switch output / 1 changeover contact
5) 0…10 V, 0 (4)…20 mA switchable

DIP switch./P* = DIP switch / Potentiometer

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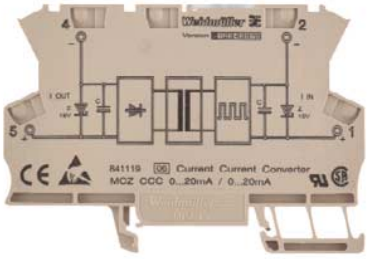
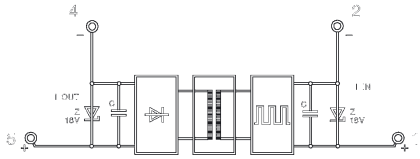
Passive Isolator

MCZ CCC 0…20 mA/0…20 mA

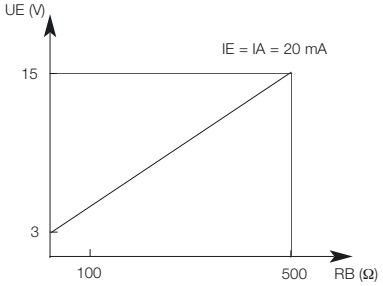


This module is a reasonably priced passive separator for galvanically separating standard 0.4...20 mA signals.
It draws its power from the measurement signal and requires no further auxiliary power.
The measurement signal is transmitted 1:1. The module is distinguished by its low power consumption as well as a response current <100 µA.

Block diagram



Working resistance diagram



Ordering data	Type	Cat. No.
for TS 35	MCZ CCC 0…20 mA/0…20 mA	**8411190000**
	without power supply	

Technical data	
Input	**0…20 mA (max. 15 V)**
Response current	< 100 µA
Voltage drop	2.5…3 V (at 20 mA)
Max. overload capacity at input	50 mA, 15 V
Output	**0…20 mA (max. 10 V)**
Set time (T99)	approx. 5 ms at 500 Ω working resistance impedance
Residual ripple	< 10 mV_{eff}
Chopper frequency	approx. 200 kHz
Transmission error	< 0.1 % from end value, + 0.05 % from mean/100 Ω working resistance
Temperature effect	< 50 ppm/K from measurement value for working resistance 0 Ω
Voltage strength	
Input/output	510 V_{eff}
EMC	EMVG
	EN 50081-1
	EN 50082-2
Approvals	CE, UL, CSA
Ambient temperature	
- assembled without spacing	-25 °C…+40 °C
- assembled with 20 mm spacing	-25 °C…+50 °C
Storage temperature	-40 °C …+85 °C
Conductor	AWG 22…12
Conductor cross-section	1.5 mm^2
Overall width	6 mm
Dimensions and accessories see	Page 305

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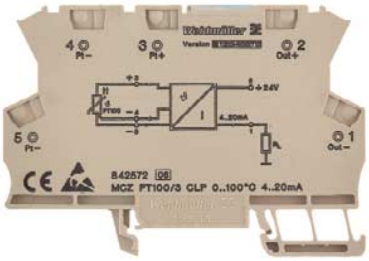
RTD Thermocouple Conditioners

- for 2 and 3 wire sensors

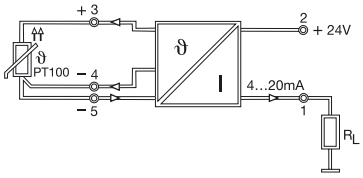
The temperature module converts measurement values from a PT 100 into analogue measurement signals. The module supplies the sensor with power. The module is distinguished by its accuracy and linearity.

MCZ PT100/3 CLP

0…100 °C / 0…120 °C / 0…150 °C / 0…200 °C / 0…300 °C
-50…+150 °C / -40…100 °C



Block diagram



Ordering data

for TS 35

Type		Cat. No.
MCZ PT100/3 CLP	0…100 °C	**8425720000**
MCZ PT100/3 CLP	0…120 °C	**8483680000**
MCZ PT100/3 CLP	0…150 °C	**8604420000**
MCZ PT100/3 CLP	0…200 °C	**8473010000**
MCZ PT100/3 CLP	0…300 °C	**8473020000**
MCZ PT100/3 CLP	-50…+150 °C	**8473000000**
MCZ PT100/3 CLP	-40…100 °C	**8604430000**

Technical data

Input	**PT 100 (according to IEC 751)**
Connection	3-wire / 2-wire*
Max. wire resistance	each 50 Ω
Leadwire resistance effect	max. 0.006 °C/Ω
Supply current	0.8 mA
Output	**4…20 mA****
Load	750 Ω at 24 V
Supply voltage	max: 30V / min: 9 V+20mA x R_L
Residual ripple of supply voltage	max: 1.5 V at 100 Hz
Set time	10 ms
Accuracy	Type. 0.2 % max. 0.5 % v. FSR
Linearity	<0.1 % v. FSR
Temperature coefficient	max. ±250 ppm/°C
Open circuit recognition	yes
EMC	EMVG
	EN 50081-1
	EN 50082-2
Approvals	CE, UL, CSA
Ambient temperature	0 °C…+50 °C
Storage temperature	-20 °C…+85 °C
Conductor	AWG 22…12
Conductor cross-section	1.5 mm^2
Overall width	6 mm
* Putting a bridge between Pins 4 and 5	** current loop supplied
Dimensions and accessories see	Page 305

Analogue Signal Processing

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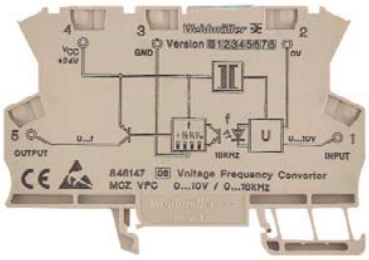
Frequency Signal Conditioners

- Tension clamp connection
- LED-Display
- Adjustable frequency output

The option of reading-in the analogue signals from the field via counter inputs of the control is made possible by converting the analogue signals in to frequencies. It is recommended that twisted and shielded 2-wire cables are used.

	MCZ VFC	MCZ CFC	MCZ CFC
	0…10 V	0…20 mA	4…20 mA CLP



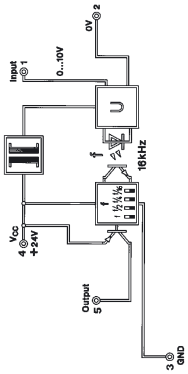
Block diagram/settings

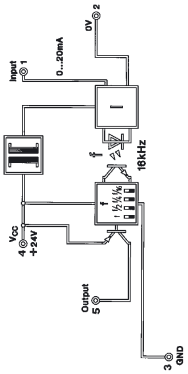
MCZ VFZ 0…10 V and MCZ CFC 0…20 mA

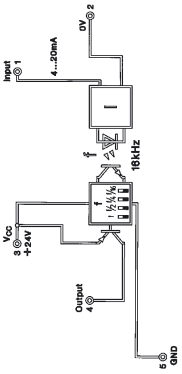
1	2	3	4	DIP switch
1	0	0	0	0…16 kHz
0	1	0	0	0…8 kHz
0	0	1	0	0…4 kHz
0	0	0	1	0…1 kHz

MCZ CFC 4…20 mA CLP

1	2	3	4	DIP switch
1	0	0	0	3.2…16 kHz
0	1	0	0	1.6…8 kHz
0	0	1	0	0.8…4 kHz
0	0	0	1	0.2…1 kHz







Ordering data		Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
for TS 35	W	MCZ VFC	**8461470000**	MCZ CFC	**8461480000**	MCZ CFC	**8461490000**
Technical data							
Input ranges		0…10 V		0…20 mA		4…20 mA LP*	
Overload limits, input		30 V		50 mA		50 mA	
Input resistance		100 kΩ		50 Ω			
Voltage drop, input				1 V at 20 mA		5.8…6.4 at 20 mA	
Output							
Output frequency, end value		1 kHz, 4 kHz, 8 kHz, 16 kHz		1 kHz, 4 kHz, 8 kHz, 16 kHz		1 kHz, 4 kHz, 8 kHz, 16 kHz	
Frequency adjustment		DIL switch		DIL switch		DIL switch	
Readjustment range		±10 %, internal		±10 %, internal		±10 %, internal	
Output level		PNP, Ub- 0.7 V		PNP, Ub- 0.7 V		PNP, Ub- 0.7 V	
Output current		max. 20 mA		max. 20 mA		max. 20 mA	
Display		LED, pulsing		LED, pulsing		LED, pulsing	
Supply voltage		24 Vdc ±10 %		24 Vdc ±10 %		24 Vdc ±20 %	
Power consumption		14 mA, w/o load		14 mA w/o load		14 mA w/o load	
Making current limit		200 mA		200 mA			
Polarisation protection		yes		yes		yes	
Accuracy		0.2 % v. FSR		0.2 % v. FSR		0.15 % v. FSR	
Temperature coefficient		< 250 ppm/°C		< 250 ppm/°C		< 250 ppm/°C	
Coordination of insulation according to EN 50178							
Voltage strength input/output		1 kVdc		1 kVdc			
Rated voltage		100 V		100 V		150 V	
Rated surge voltage		1.5 kV		1.5 kV		2.5 kV	
Overvoltage category		III		III		III	
Voltage strength I/O to mounting rail		4 kV_{eff}/ 1 min		4 kV_{eff}/ 1 min		4 kV_{eff}/ 1 min	
Operating temperature		0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C	
Storage temperature		-25 °C…+85 °C		-25 °C…+85 °C		-25 °C…+85 °C	
Overall width		6 mm		6 mm		6 mm	
Conductor cross-section		1.5 mm^2		1.5 mm^2		1.5 mm^2	
Dimensions and accessories see		Page 305		Page 305		Page 305	

* without DC/DC converter input supply vie current loop

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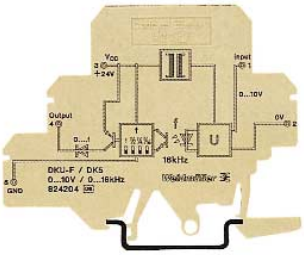
Frequency Signal Conditioners

- Screw connection
- LED-Display
- Adjustable frequency output

For EMC reasons, frequency processing modules must be used in conjunction with shielded cables. This measure prevents interference of analogue and frequency signals by other signal cables and vice versa.

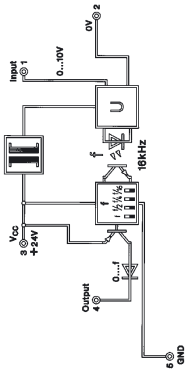
	DKA U/f	DKA I/f	DKA I/f*

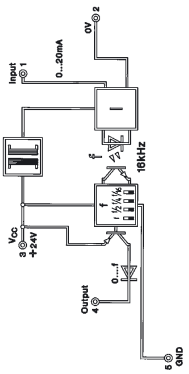


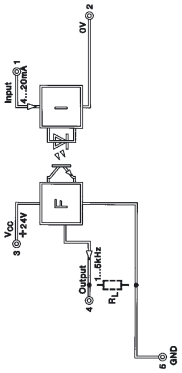
Block diagram/settings

DKA U/f and DKA I/f

1	2	3	4	DIP switch
1	0	0	0	0…16 kHz
0	1	0	0	0…8 kHz
0	0	1	0	0…4 kHz
0	0	0	1	0…1 kHz







Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
for TS 32 Y						
for TS 35 W						
with combi foot TS 32/TS 35	DKA U/f	**8242040000**	DKA I/f	**8258870000**	DKA I/f *	**8081330000**
Technical data						
Input ranges	0…10 V		0…20 mA		4…20 mA	
Overload limits, input	100 V		50 mA		50 mA	
Input resistance	100 kΩ		50 Ω		max. 320 Ω at 20 mA	
Voltage drop, input			1 V at 20 mA		max. 6.4 V at 20 mA	
Output						
Output frequency, end value	1 kHz, 4 kHz, 8 kHz, 16 kHz		1 kHz, 4 kHz, 8 kHz, 16 kHz		5 kHz (1…5 kHz)	
Frequency adjustment	DIL switch		DIL switch			
Readjustment range	±10 %, internal		±10 %, internal			
Output level	PNP, Ub- 0.7 V		PNP, Ub- 0.8 V		Ub- 3 V	
Output current	max. 20 mA		max. 20 mA		max. 20 mA	
Display	LED, pulsing		LED, pulsing			
Decoupling diode	present		present		present	
Supply voltage	24 Vdc ±10 %		24 Vdc ±10 %		19.2…28.8 Vdc	
Power consumption	14 mA, w/o load		14 mA w/o load		<13 mA w/o load	
Making current limit	200 mA		200 mA			
Polarisation protection	yes		yes		yes	
Accuracy	0.2 % v. FSR		0.2 % v. FSR		0.15 % v. FSR	
	<250 ppm/°C		<250 ppm/°C		<250 ppm/°C 2	
Coordination of insulation to DIN VDE 0160, Draft 11/94						
Voltage strength input/output	1 kVdc		1 kVdc		4 kV_{eff}	
Rated voltage					150 V	
Rated surge voltage					2.5 kV	
Overvoltage category					III	
Voltage strength to mounting rail	4 kV_{eff}		4 kV_{eff}		4 kV_{eff}	
Operating temperature	0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C	
Storage temperature	-25 °C…+60 °C		-25 °C…+60 °C		-25 °C…+60 °C	
Overall width	6 mm		6 mm		6 mm	
Conductor cross-section	0.5…4 mm^2		0.5…4 mm^2		0.5…4 mm^2	

Accessories	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
End plate	AP DK5	**8268870000**	AP DK5	**8268870000**	AP DK5	**8268870000**
Dimensions and accessories see	Page 305		Page 305		Page 305	

* without DC/DC converter
Input current loop supplied

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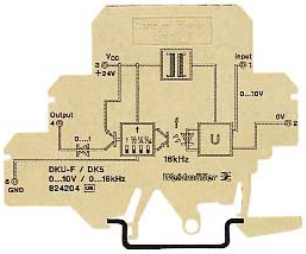
Frequency Signal Conditioners

- Screw connection
- LED-Display
- Adjustable frequency output
- multiplex capable

For EMC reasons, frequency processing modules must be used in conjunction with shielded cables. This measure prevents interference of analogue and frequency signals by other signal cables and vice versa.

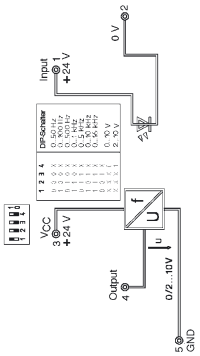
DKA f/U

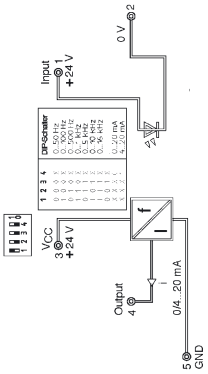


DKA f/I

Block diagram/settings

1	2	3	4	DIP switch
0	0	0	X	0…50 Hz
1	0	0	X	0…100 Hz
0	1	0	X	0…500 Hz
1	1	0	X	0…1 kHz
0	1	1	X	0…5 kHz
1	0	1	X	0…10 kHz
1	1	1	X	0…16 kHz
0	0	1	X	Customer specific
X	X	X	0	0…20 mA / 0…10 V
X	X	X	1	4…20 mA / 2…10 V





Ordering data		Type	Cat. No.	Type	Cat. No.
for TS 32	Y				
for TS 35	W				
with combi foot TS 32/TS 35		DKA f/U	**8283810001**	DKA f/I	**8311870001**
Technical data					
Input ranges		0…50/100/500 Hz		0…50/100/500 Hz	
		0…1/5/10/16 kHz		0…1/5/10/16 kHz	
Overload limits, input					
Input resistance		10 kΩ		10 kΩ	
Voltage drop, input					
Output		0/2…10 V		0/4…20 mA	
Output frequency, end value					
Frequency adjustment		DIL switch		DIL switch	
Readjustment range					
Output level					
Output current					
Display					
Decoupling diode					
Supply voltage		24 Vdc ±10 %		24 Vdc ±10 %	
Power consumption		32 mA + I_{Load}		32 mA + I_{Load}	
Making current limit					
Polarisation protection		yes		yes	
Accuracy		0.5 % (8-bit resolution)		0.5 % (8-bit resolution)	
Coordination of insulation to DIN VDE 0160, Draft 11/94					
Voltage strength input/output		2.5 kV		2.5 kV	
Rated voltage					
Rated surge voltage					
Overvoltage category					
Voltage strength to mounting rail		4 kV_{eff}		4 kV_{eff}	
Operating temperature		0 °C…+50 °C		0 °C…+50 °C	
Storage temperature		-25 °C…+60 °C		-25 °C…+60 °C	
Overall width		6 mm		6 mm	
Conductor cross-section		0.5…4 mm^2		0.5…4 mm^2	
Dimensions and accessories see		Page 305		Page 305	

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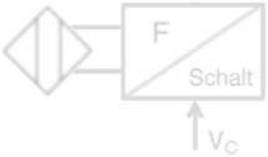
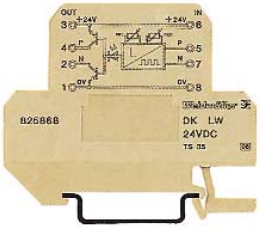
Monitoring Revolutions

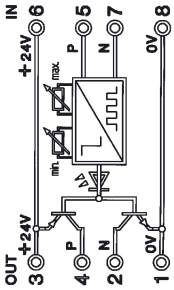
DK LW





If only one revolution limit is to be evaluated, the potentiometer for f_{max} must be set to end stop or the potentiometer for f_{min} to left stop. Then only the other is in each case active for setting the limit value.

Block diagram/settings



Ordering data	Type	Cat. No.
for TS 32 Y		
for TS 35 W	DK LW	**8258680000**

Technical data	
Input	Initiators, NPN **or** PNP
Number of inputs	1
Input frequency	10 - 6250 U/min.
Range selection	3 switchable revolutions ranges: 10-130, 100-1300, 1000-7800 r.p.m.
Fine adjustment	2 potentiometers for upper/lower revs limit
Input nominal level	24 Vdc = High, O V = Low
Overload limits	30 Vdc
Switching threshold	High >18 V, Low <7 V
Pulse duration	>0.5 ms
Input current	approx. 3.5 mA (24 V)
Reverse polarity protection	yes
Output	Optional PNP **or** NPN
Function	Output active, if f within set revs limit
Output level	Ub- 1.8 V
Output current	20 mA max.
Decoupling diode	yes
Status LED	green LED
Short-circuit proof	no
Operating voltage	24 V –10 % + 20 %
Power consumption	<10 mA, w/o load, without initiator
Reverse polarity protection	yes
Galvanic isolation	no
Voltage strength to mounting rail	4 kV_{eff}
Operating temperature	0…+50 °C
Storage temperature	-40…+60 °C
Overall width	12 mm
Conductor cross-section	0.5…4 mm^2
Insulation stripping length	7 mm
Others	Initiator power supply via module possible

Accessories	Type	Cat. No.
End plate	AP DKT4	**0687560000**
Dimensions and accessories see	Page 278	

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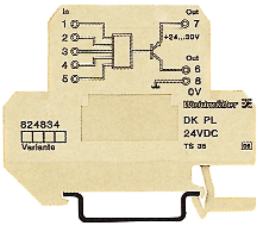
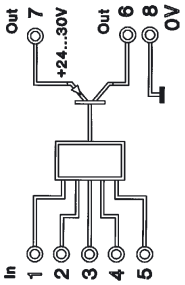
Preprocessing Logic

- Screw connection
- logic function and time function combined
- individually programmable (further functions on request)

DK PL



Block diagram



Ordering data		Type	Cat. No.
for TS 32	Y	on request	
for TS 35	W	DK PL	**8248340000***

Technical data	
Logical function	Programmable, see note
Number of inputs	5
Input nominal level	24 Vdc = High, 0 V = Low
Overload limits	30 Vdc
Switching threshold	High >18 V, Low <7 V
Pulse duration	>1 ms
Input current	approx. 1.5 mA per input (24 V)
Output	PNP
Output level	Ub- 1 V
Output current	20 mA max.
Decoupling diode	no
Status LED	green LED
Short-circuit proof	no
Operating voltage	24 V ±20 %
Power consumption	<10 mA
Reverse polarity protection	yes
Galvanic isolation	no
Voltage strength to mounting rail	4 kV_{eff}
Operating temperature	0 °C…+50 °C
Storage temperature	-40 °C…+60 °C
Overall width	12 mm
Conductor cross-section	0.5…4 mm^2
Insulation stripping length	7 mm

Accessories	Type	Cat. No.
End plate	AD DKT4	**0687560000**
Ordering example: RS FLIP-FLOP		**8248340002**

Dimensions see Page 278

* (not programmed - function next page)

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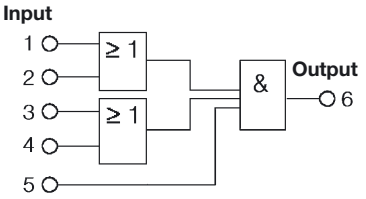
Remark:
The module is programmed according to customers specifications.
Up to 5 inputs can be linked with various logic and timer functions,
e.g.: AND, OR, EXOR, NAND, NOR, EXNOR, delay elements, etc.
The output is either low or high active.

824834 0001 DKPL

A = (E1 OR E2) AND (E3 OR E4) AND E5

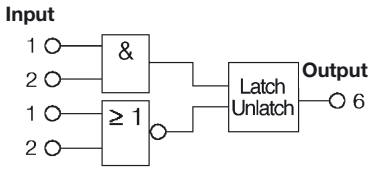
State	Input 5	4	3	2	1	Output 6
1	0	0	0	0	0	0
2	0	0	0	0	1	0
3	0	0	0	1	0	0
4	0	0	0	1	1	0
5	0	0	1	0	0	0
6	0	0	1	0	1	0
7	0	0	1	1	0	0
8	0	0	1	1	1	0
9	0	1	0	0	0	0
10	0	1	0	0	1	0
11	0	1	0	1	0	0
12	0	1	0	1	1	0
13	0	1	1	0	0	0
14	0	1	1	0	1	0
15	0	1	1	1	0	0
16	0	1	1	1	1	0
17	1	0	0	0	0	0
18	1	0	0	0	1	0
19	1	0	0	1	0	0
20	1	0	0	1	1	0
21	1	0	1	0	0	0
22	1	0	1	0	1	1
23	1	0	1	1	0	1
24	1	0	1	1	1	1
25	1	1	0	0	0	0
26	1	1	0	0	1	1
27	1	1	0	1	0	1
28	1	1	0	1	1	1
29	1	1	1	0	0	0
30	1	1	1	0	1	1
31	1	1	1	1	0	1
32	1	1	1	1	1	1



824834 0002 DKPL

Inputs 1 and 2 have the function of a RS FLIP-FLOP
Inputs 3, 4 and 5 have no function

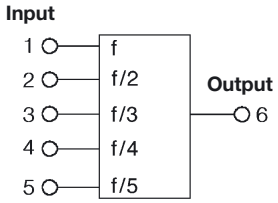
Input 2	1	Output 6
0	0	0 (is stored)
0	1	No change of stored state
1	0	No change of stored state
1	1	1 (is stored)
Inputs 3, 4 and 5 no function		No change of stored state



824834 0003 DKPL - Frequency divider

Inputs 1 - 5 determine the divider factor
Input 1 = divider factor 1: $F_{OUT} = F_{IN}$ 1
Input 2 = divider factor 2: $F_{OUT} = F_{IN}$ 2
Input 5 = divider factor 5: $F_{OUT} = F_{IN}$ 5; F_{IN} max. = 12 kHz

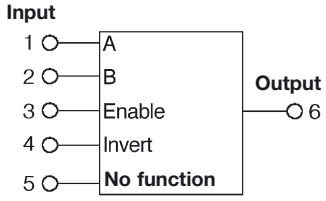
Input	Output 6
1	$f_{out} = f_{in}$
2	$f_{out} = f_{in} / 2$
3	$f_{out} = f_{in} / 3$
4	$f_{out} = f_{in} / 4$
5	$f_{out} = f_{in} / 5$
	Note: An new divider factor can only be used if operating voltage is switched off. f_{in} max. = 12 kHz

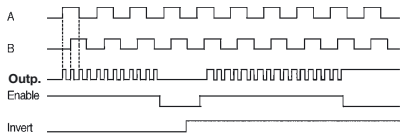


824834 0004 DKPL

Input 1: Signal A of an incremental generator
Input 2: Signal B 90 is shifted
Input 3: Enable High Active
Input 4: Output signal inverts High Active
Input 5: No function
Output: For each slope of signal A or B, the output is set to 20 - 30 Us.
(I.e.: $F_{OUT} = 4xF_{IN}$)
F_{IN} max. 1 kHz

	Connection	Description
1	A	Signal A 90 ° leading F_{max} = 1 kHz
2	B	Signal B 90 ° following F_{max} = 1 kHz
3	Enable	Output is released
4	Invert	Output signal invert
5		No function
6		$f_{out} = 4 \times f_{A/B}$ (max. 4 kHz)





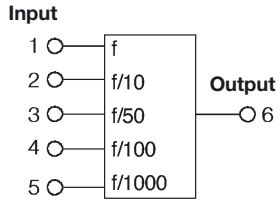
824834 0005 DKPL

Length of input signal between 80 and 100 ms.
Length of output signal 100 ms, only 2 pulses,
Relation pulse-interruption 1:1.
The positive slope of the input signal has to be analysed. Only input E1 is used.

824834 0006 DKPL

Input 1: $F_{OUT} = F_{IN}$
Input 2: $F_{OUT} = F_{IN}$ 10

Input	Output 6
1	$f_{out} = f_{in}$
2	$f_{out} = f_{in} / 10$
3	$f_{out} = f_{in} / 50$
4	$f_{out} = f_{in} / 100$
5	$f_{out} = f_{in} / 1000$
	Note: A new divider factor can only be used if the operating voltage is switched off. f_{in} max. = 3 kHz



824834 007 DKPL

Input 1	2	3	4	5	Output Out
L	L	X	X	X	No function
H	L	X	X	X	f = 1 Hz
L	H	X	X	X	f = 10 Hz
H	H	X	X	X	f = 1 Hz

L -> 0 V or connection open
H -> +24 …30 Vdc
X -> no effect on output function, L or H

824834 0008 DKPL

Input 1	2	Output
H	H	H
L	H	L

824834 0010 DKPL

RS FLIP-FLOP with superior S - input (connection 2)
Input connections 3, 4 and 5 must have 0 V or remain open!

Connection 1 Logic R-Input		Connection 2 Logic S-Input		Connection 6 Logic Output	
0 V or open	L	0 V or open	L	previous state is stored	
+24 Vdc	H	0 V or open	L	0 V	L
0 V or open	L	+24 Vdc	H	+24 Vdc	H
+24 Vdc	H	+24 Vdc	H	+24 Vdc	H

824834 0501 DKPL

The module allows the input frequency at connection 1 (0...max. 50 kHz) to be divided with 2 fixed divider factors.
Depending on connection 2, the output frequency is transmitted from output connection 6.
Connections 3, 4 and 5 have no function.

Connect. 2 Logic		Factor	Inp. frequency Connection 1	Outp. frequency Connection 2
0 V or open	L	75	0…30 kHz	0…400 Hz
24 Vdc	H	27	0…10.8 kHz	0…400 Hz

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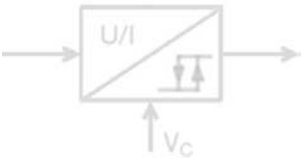
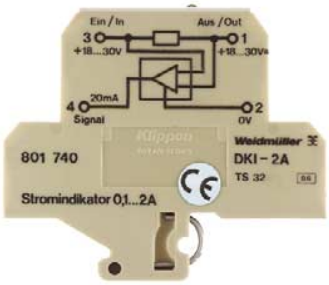
Current sensor

- Screw connection
- Mounts onto on mounting rail
- Wide spectrum of functions
- In part, individually adjustable

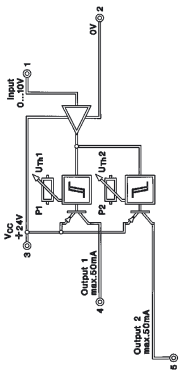


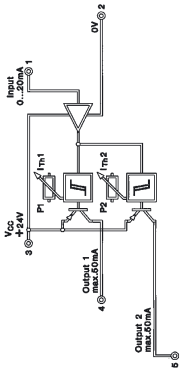
	DKSC 0-10 V	DKSC 0-20 mA	DKI 2A

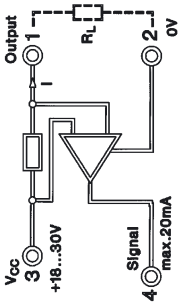


Block diagram/settings

S1	S2	DIP switch
on	on	10…100 mV
on	off	30 mV…1 V
off	X	300 mV…10 V







Ordering data		Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
for TS 32	Y					DKI 2A	**8017400000**
for TS 35	W					DKI 2A	**8017410000**
with combi foot TS 32/TS 35		DKSC 0-10 V	**8019640000**	DKSC 0-20 mA	**8031320000**		
Technical data							
Input signal		0…10 V		0(4)…20 mA		0.1…2 A	
Input resistance		60 kΩ		50 Ω			
Voltage drop, input				1 V		125 mV at 2 A	
Cut-off frequeny		100 Hz		100 Hz			
Switchable input range		DIL switch for 3 ranges				no	
Switching point settings		2 threshold Uth 1 and Uth 2		2 threshold Uth 1 and Uth 2		Fixed:ON >90 mA	
		with 2 front potentiometers		with 2 front potentiometers		OFF <50 mA	
Hysteresis		each 1 %		each 1 %			
Output		double switch output		double switch output		single switch output	
Output level		per PNP, Ub- 1.2 V		per PNP, Ub- 1.2 V		PNP, Ub-0.1 V	
Output current		50 mA		50 mA		20 mA	
Function		Uin <Uth1: output 1 active		Iin <Ith1: output 1 active			
		Uin >Uth2: output 2 active		Iin >Ith2: output 2 active			
Status LED		no		no		green LED	
Operating voltage		24 Vdc ±20 %		24 Vdc ±20 %		18…30 Vdc	
Power consumption		approx. 15 mA		approx. 15 mA		approx. 10 mA	
Galvanic isolation		no		no		no	
Voltage strength to mounting rail		4 kV_{eff}		4 kV_{eff}		4 kV_{eff}	
Operating temperature		0 °C…+50 °C		0 °C…+50 °C		-25 °C…+50 °C	
Storage temperature		-25 °C…+60 °C		-25 °C…+60 °C		-40 °C…+85 ° C	
Overall width		6 mm		6 mm		6 mm	
Conductor cross-section		0.5…4 mm^2		0.5…4 mm^2		0.5…4 mm^2	
EMC resistance							
Burst acc. to EN 61000-4-4	Input/outputs	Test severity 4, self restoring					
	Power supply	Test severity 4, self restoring					
ESD acc. to EN 61000-4-2	Contact discharge	Test severity 4					
	Air discharge	Test severity 3					
Accessories		Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
End plate		AP DK5	**8268870000**	AP DK5	**8268870000**	AP DKT4	**0687560000**
Dimensions see		Page 278		Page 278		Page 278	

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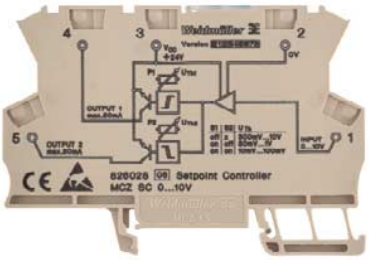
Threshold Monitoring

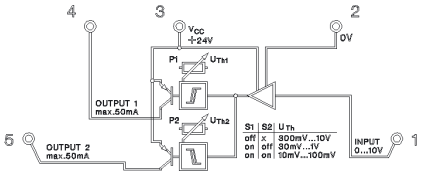
The Setpoint Controller allows cost effective units to be built for monitoring analogue signals. An upper and lower limit value, which covers the entire signal range, can be set by the user via 2 potentiometers. The respective statuses of the upper and lower limit value are indicated at the 2 digital outputs (upper limit value under/over flow; lower limit value under/over flow).

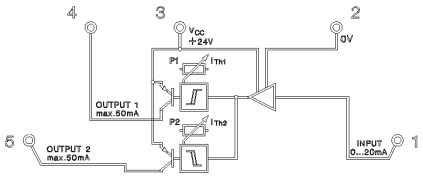
MCZ SC 0…10 Vdc

MCZ SC 0…20 mA



Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
for TS 35	MCZ SC 24 V/0…10V	**8260280000**	MCZ SC 24 V/0…20 mA	**8227350000**

Technical data					
Voltage supply					
Supply voltage	24 Vdc ± 20 %				24 Vdc ± 20 %
Supply current	15 mA				15 mA
Input					
Input voltage	0…10 V				0.5…20 mA
Input resistance	60 kΩ				50 Ω
Voltage drop at full scale					1 V
Max. input current					40 mA
Cut-off frequeny	100 Hz				100 Hz
Transmission behaviour		S1	S2	Temperature coefficient T_K	Temperature coefficient T_K 250 ppm max.
Threshold voltage ranges of U_{th}	10…100 mV	on	on	500 ppm max.	
	0.03…1 V	on	off	250 ppm max.	
	0.3…10 V	off	x	250 ppm max.	
Setting of switching threshold	via 2 potentiometers (12 turns)				via 2 potentiometers (12 turns)
Hysteresis of switching threshold	1 % of the end value				1 % of the end value
Function of output 1	active High for $U_{Input} < U_{th1}$ (set via P1)				active High for $I_{Input} < I_{th1}$ (set via P1)
Function of output 2	active High for $U_{Input} > U_{th2}$ (set via P2)				active High for $I_{Input} > I_{th2}$ (set via P2)
Response time	< 250 µs (switch threshold at 90% of the max. input signal; $R_L \leq 1$ kΩ)				< 250 µs (switch threshold at 90% of the max. input signal; $R_L \leq 1$ kΩ)
Output	2 channel switching PNP				2 channel switching PNP
Output current per output	max. 50 mA				max. 50 mA
Voltage drop at output transistor	< 1.2 V at 50 mA				< 1.2 V at 50 mA
Insulation coordination/safe separation to EN 50178					
Separation input / output	none				none
Dielectric strength I/O to mounting rail	4 kVeff / 1 min				4 kVeff / 1 min
Ambient temperature	0 °C…+50 °C				0 °C…+50 °C
Storage temperature	-25 °C…+60 °C				-25 °C…+60 °C
Conductor	AWG 22…12				AWG 22…12
Conductor cross-section	1.5 mm^2				1.5 mm^2
Approvals	CE, UL, CSA				CE, UL, CSA
Overall width	6 mm				6 mm
Dimensions and accessories see	Page 305				Page 305

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Passive Isolator DC/DC

WAVEANALOG DC/DC

- **input loop powered**
- **galvanic isolation**
- **1-, 2-channel versions**
- **low power consumption**
- **safe separation**

Approvals:

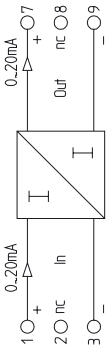
CCC LP (1 channel)

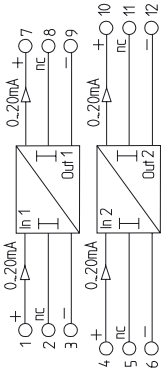
0(4) ... 20 mA / 0(4) ... 20 mA

CCC LP (2 channel)

0(4) ... 20 mA / 0(4) ... 20 mA

Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection 1 channel	WAS5 CCC LP	**8444950000**		
Tension clamp connection 1 channel	WAZ5 CCC LP	**8444960000**		
Screw connection 2 channel			WAS5 CCC LP	**8463580000**
Tension clamp connection 2 channel			WAZ5 CCC LP	**8463590000**
Input/output	0(4) ... 20 mA / 0(4) ... 20 mA		0(4) ... 20 mA / 0(4) ... 20 mA	

Technical data* (per channel)		
Input signal	0 ... 20 mA (4 ... 20 mA)	0 ... 20 mA (4 ... 20 mA)
Input voltage max.	18 V	18 V
Input current max	50 mA	50 mA
Operating current	< 100 µA	< 100 µA
Voltage drop	approx. 3 V at R_L= 0 Ω I_{in} = 20 mA approx. 13 V at R_L= 500 Ω at I_{in} = 20 mA	approx. 3 V at R_L= 0 Ω I_{in} = 20 mA approx. 13 V at R_L= 500 Ω at I_{in} = 20 mA
Output signal	0 ... 20 mA (4 ... 20 mA)	0 ... 20 mA (4 ... 20 mA)
Load resistance	≤ 500 Ω	≤ 500 Ω
Accuracy at Tu=23 °C	< 0.1% of FS	< 0.1% of FS
Influence of load resistance	< 0.1% from measurement value per 100 Ω load resistance	< 0.1% from measurement value per 100 Ω load resistance
Temperature coefficient	50 ppm / K of FS	50 ppm / K of FS
Set time	4.5 ms at 500 Ω working resistance	4.5 ms at 500 Ω working resistance
Residual ripple	< 20 mV_{eff}	< 20 mV_{eff}
Chopper frequency	approx. 170 kHz	approx. 170 kHz

General		
Operating temperature	-25 °C ... +70 °C	-25 °C ... +70 °C
Storage temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, UL, CSA, GL	CE, UL, CSA, GL

Coordination of insulation according to EN 50178, 04/98 (safe separation)		
Rated voltage	300 V	300 V
Rated surge voltage	6 kV	6 kV
Overvoltage category	III	III
Contamination class	2	2
Clearance and creepage distance	≥ 5.5 mm	≥ 5.5 mm
Isolation voltage, voltage strength		
Input/output, channel / channel	4 kV_{eff} / 1 s	4 kV_{eff} / 1 s
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178 (safe separation)	EN 50178 (safe separation)
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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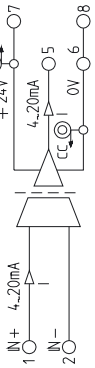
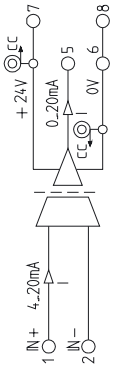
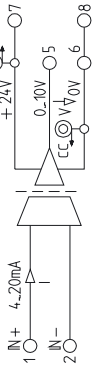
DC/DC-Signal Conditioners

WAVEANALOG DC/DC

- **voltage supply on output side**
- **2-way-isolation**
- **analogue signal conditioning**
- **galvanic isolation between input/output signal**
- **Input loop powered**
- **cross-connectable voltage supply via cross-connectors**

Approvals:

	CCC DC	**CCC DC**	**CVC DC**
	4 ... 20 mA / 4 ... 20 mA	4 ... 20 mA / 0 ... 20 mA	4 ... 20 mA / 0 ... 10 V
Block diagram			
			
Ordering data	Type / Cat. No.	Type / Cat. No.	Type / Cat. No.
Screw connection	WAS4 CCC DC **8444980000**	WAS4 CCC DC **8445010000**	WAS4 CVC DC **8445040000**
Tension clamp connection	WAZ4 CCC DC **8444990000**	WAZ4 CCC DC **8445020000**	WAZ4 CVC DC **8445050000**
Input/output	4 ... 20 mA / 4...20 mA	4 ... 20 mA / 0 ... 20 mA	4 ... 20 mA / 0 ... 10V
Technical data*			
Input signal	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA
Input voltage max.	7 V	7 V	7 V
Input current max	25 mA	25 mA	25 mA
Output signal	4 ... 20 mA	0 ... 20 mA	0 ... 10 V
Load resistance	≤ 500 Ω	≤ 500 Ω	≥ 1 kΩ
Accuracy at Tu=23 °C	± 0.2% of FS	± 0.2% of FS	± 0.2% of FS
Temperature coefficient	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS
Response time	≤ 30 ms (typ. 20 ms)	≤ 30 ms (typ. 20 ms)	≤ 30 ms (typ. 20 ms)
Cut-off frequeny (-3 dB)	≥ 15 Hz (typ. 20 Hz)	≥ 15 Hz (typ. 20 Hz)	≥ 15 Hz (typ. 20 Hz)
General			
Voltage supply	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)
Power consumption	< 32 mA at I_{out} = 20 mA	< 32 mA at I_{out} = 20 mA	< 20 mA at I_{out} = 10 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C (mounted)	0 °C ... +55 °C (mounted)	0 °C ... +55 °C (mounted)
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5
Approvals	CE, UL, CSA	CE, UL, CSA	CE, UL, CSA
Coordination of insulation according to EN 50178, 04/98			
Rated voltage	300 V	300 V	300 V
Rated surge voltage	4 kV	4 kV	4 kV
Overvoltage category	III	III	III
Contamination class	2	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm	≥ 3 mm
Isolation voltage, voltage strength			
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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DC/DC-Signal Conditioners

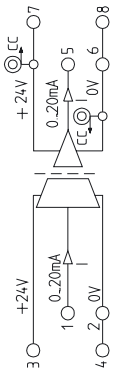
WAVEANALOG DC/DC

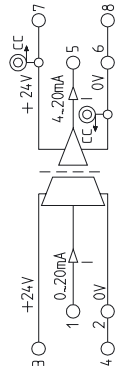
- **voltage supply on both sides**
- **2-way-isolation**
- **analogue signal conditioning**
- **galvanic isolation between input/output signal**
- **cross-connectable voltage supply via cross-connectorss**

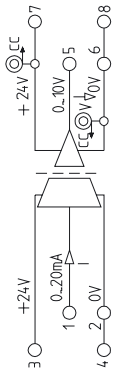
Approvals:

	CCC DC	CCC DC	CVC DC
	0 ... 20 mA / 0 ... 20 mA	0 ... 20 mA / 4 ... 20 mA	0 ... 20 mA / 0 ... 10 V

Block diagram







Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS4 CCC DC	**8445070000**	WAS4 CCC DC	**8446970000**	WAS4 CVC DC	**8447020000**
Tension clamp connection	WAZ4 CCC DC	**8445080000**	WAZ4 CCC DC	**8446990000**	WAZ4 CVC DC	**8447030000**
Input/output	0 ... 20 mA / 0 ... 20 mA		0 ... 20 mA / 4 ... 20 mA		0 ... 20 mA / 0 ... 10 V	

Technical data*			
Input signal	0 ... 20 mA	0 ... 20 mA	0 ... 20 mA
Input current max	25 mA	25 mA	25 mA
Input resistance	50 Ω	50 Ω	50 Ω
Output signal	0 ... 20 mA	4 ... 20 mA	0 ... 10 V
Load resistance	≤ 500 Ω	≤ 500 Ω	≥ 1 kΩ
Accuracy at Tu=23 °C	± 0.2% of FS	± 0.2% of FS	± 0.2% of FS
Temperature coefficient	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS
Response time	≤ 30 ms (typ. 16 ms)	≤ 30 ms (typ. 16 ms)	≤ 30 ms (typ. 16 ms)
Cut-off frequeny (-3 dB)	≥ 15 Hz (typ. 25 Hz)	≥ 15 Hz (typ. 25 Hz)	≥ 15 Hz (typ. 25 Hz)

General			
Voltage supply	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)
Power consumption input	< 11 mA at I_{in} = 20 mA	< 11 mA at I_{in} = 20 mA	< 11 mA at I_{in} = 20 mA
Power consumption output	< 32 mA at I_{out} = 20 mA	< 32 mA at I_{out} = 20 mA	< 20 mA at I_{out} = 10 V
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C (mounted)	0 °C ... +55 °C (mounted)	0 °C ... +55 °C (mounted)
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5
Approvals	CE, UL, CSA	CE, UL, CSA	CE, UL, CSA

Coordination of insulation according to EN 50178, 04/98			
Rated voltage	300 V	300 V	300 V
Rated surge voltage	4 kV	4 kV	4 kV
Overvoltage category	III	III	III
Contamination class	2	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm	≥ 3 mm
Isolation voltage, voltage strength			
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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DC/DC Signal Conditioners

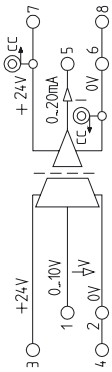
WAVEANALOG DC/DC

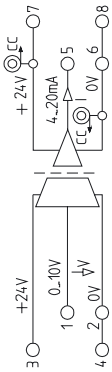
- **voltage supply on both sides**
- **2-way-isolation**
- **analogue signal conditioning**
- **galvanic isolation between input/output signal**
- **cross-connectable voltage supply via cross-connectors**

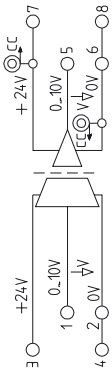
Approvals:

	VCC DC	**VCC DC**	**VVC DC**
	0 ... 10 V / 0 ... 20 mA	0 ... 10 V / 4 ... 20 mA	0 ... 10 V / 0 ... 10 V

Block diagram







Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS4 VCC DC	**8447050000**	WAS4 VCC DC	**8447100000**	WAS4 VVC DC	**8447130000**
Tension clamp connection	WAZ4 VCC DC	**8447080000**	WAZ4 VCC DC	**8447110000**	WAZ4 VVC DC	**8447140000**
Input/output	0 ... 10 V / 0 ... 20 mA		0 ... 10 V / 4 ... 20 mA		0 ... 10 V / 0 ... 10 V	

Technical data*			
Input signal	0 ... 10 V	0 ... 10 V	0 ... 10 V
Input voltage max.	15 V	15 V	15 V
Input resistance	500 kΩ	500 kΩ	500 kΩ
Output signal	0 ... 20 mA	4 ... 20 mA	0 ... 10 V
Load resistance	≤ 500 Ω	≤ 500 Ω	≥ 1 kΩ
Accuracy at Tu=23°C	± 0.2% of FS	± 0.2% of FS	± 0.2% of FS
Temperature coefficient	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS
Response time	≤ 30 ms (typ. 25 ms)	≤ 30 ms (typ. 25 ms)	≤ 30 ms (typ. 25 ms)
Cut-off frequeny (-3 dB)	≥ 13 Hz (typ. 17 Hz)	≥ 13 Hz (typ. 17 Hz)	≥ 13 Hz (typ. 17 Hz)

General			
Voltage supply	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)
Power consumption input	< 11 mA at U_{in} = 10 V	< 11 mA at U_{in} = 10 V	< 11 mA at U_{in} = 10 V
Power consumption output	< 32 mA at I_{out} = 20 mA	< 32 mA at I_{out} = 20 mA	< 20 mA at I_{out} = 10 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C (mounted)	0 °C ... +55 °C (mounted)	0 °C ... +55 °C (mounted)
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5
Approvals	CE, UL, CSA	CE, UL, CSA	CE, UL, CSA

Coordination of insulation according to EN 50178, 04/98			
Rated voltage	300 V	300 V	300 V
Rated surge voltage	4 kV	4 kV	4 kV
Overvoltage category	III	III	III
Contamination class	2	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm	≥ 3 mm
Isolation voltage, voltage strength			
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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DC/DC Signal Conditioners

NEW

WAVEANALOG DC/DC

- 3-way-isolation
- analogue signal conditioning
- indication LED
- cross-connectable voltage supply via cross-connectors

CCC
0 ... 20 mA / 0 ... 20 mA

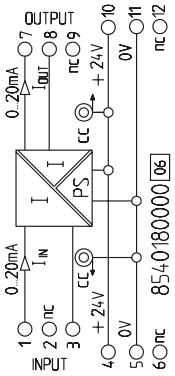
CCC
0 ... 20 mA / 4 ... 20 mA

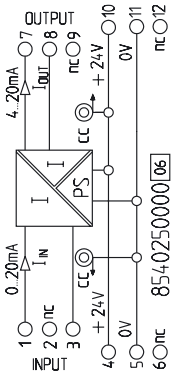
CVC
0 ... 20 mA / 0 ... 10 V

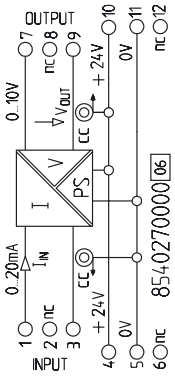
Approvals:

CE cULus

Block diagram







Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS5 CCC	**8540180000***	WAS5 CCC	**8540250000**	WAS5 CVC	**8540270000**
Tension clamp connection	WAZ5 CCC	**8540190000***	WAZ5 CCC	**8540260000**	WAZ5 CVC	**8540280000**
Input/output	0 ... 20 mA / 0 ... 20 mA		0 ... 20 mA / 4 ... 20 mA		0 ... 20 mA / 0 ... 10 V	

Technical data**			
Input signal	0 ... 20 mA	0 ... 20 mA	0 ... 20 mA
Input current max	25 mA	25 mA	25 mA
Input resistance	≤ 110 Ω	≤ 110 Ω	≤ 110 Ω
Output signal	0 ... 20 mA	4 ... 20 mA	0 ... 10 V
Load resistance	≤ 600 Ω	≤ 600 Ω	≥ 1 kΩ
Accuracy at Tu=23 °C	0.2%	0.2%	0.2%
Temperature coefficient	± 250 ppm / K	± 250 ppm / K	± 250 ppm / K
Response time	≤ 45 ms	≤ 45 ms	≤ 45 ms
Cut-off frequeny (-3 dB)	10 Hz	10 Hz	10 Hz

General			
Voltage supply	24 Vdc ±25% (18 Vdc ... **24 Vdc** ... 30 Vdc)	24 Vdc ±25% (18 Vdc ... **24 Vdc** ... 30 Vdc)	24 Vdc ±25% (18 Vdc ... **24 Vdc** ... 30 Vdc)
Power consumption	< 1.5 W at I_{out} = 20 mA	< 1.5 W at I_{out} = 20 mA	< 1.3 W at I_{out} = 5 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C when mounted horizontally	0 °C ... +55 °C when mounted horizontally	0 °C ... +55 °C when mounted horizontally
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, cUL	CE, cUL	CE, cUL

Coordination of insulation according to EN 50178, 04/98			
Rated voltage	300 V	300 V	300 V
Rated surge voltage	4 kV	4 kV	4 kV
Overvoltage category	III	III	III
Contamination class	2	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm	≥ 3 mm
Coupling capacity			
Input / output to supply	1 nF	1 nF	1 nF
Isolation voltage, voltage strength			
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308	Page 298 + 308

** T_U = 23 °C single module
* Input/output 4 ... 20 mA/4 ... 20 mA possible

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DC/DC Signal Conditioners

NEW

WAVEANALOG DC/DC

- **3-way-isolation**
- **analogue signal conditioning**
- **indication LED**
- **cross-connectable voltage supply via cross-connectors**

Approvals:

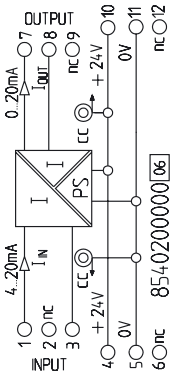
CCC

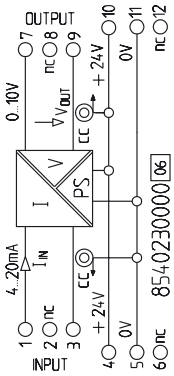
4 ... 20 mA / 0 ... 20 mA

CVC

4 ... 20 mA / 0 ... 10 V

Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS5 CCC	**8540200000**	WAS5 CVC	**8540230000**
Tension clamp connection	WAZ5 CCC	**8540210000**	WAZ5 CVC	**8540240000**
Input/output	4 ... 20 mA / 0 ... 20 mA		4 ... 20 mA / 0 ... 10 V	

Technical data		
Input signal	4 ... 20 mA	4 ... 20 mA
Input current max	25 mA	25 mA
Input resistance	≤ 110 Ω	≤ 110 Ω
Output signal	0 ... 20 mA	0 ... 10 V
Load resistance	≤ 600 Ω	≥ 1 kΩ
Accuracy at Tu=23 °C	0.2%	0.2%
Temperature coefficient	± 250 ppm / K	± 250 ppm / K
Response time	≤ 45 ms	≤ 45 ms
Cut-off frequeny (-3 dB)	10 Hz	10 Hz

General*		
Voltage supply	24 Vdc ±25% (18 Vdc ... **24 Vdc** ... 30 Vdc)	24 Vdc ±25% (18 Vdc ... **24 Vdc** ... 30 Vdc)
Power consumption	< 1.5 W at I_{out} = 20 mA	< 1.3 W at I_{out} = 5 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C when mounted horizontally	0 °C ... +55 °C when mounted horizontally
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, cUL	CE, cUL

Coordination of insulation according to EN 50178, 04/98		
Rated voltage	300 V	300 V
Rated surge voltage	4 kV	4 kV
Overvoltage category	III	III
Contamination class	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm
Coupling capacity		
Input / output to supply	1 nF	1 nF
Isolation voltage, voltage strength		
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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NEW

WAVEANALOG DC/DC

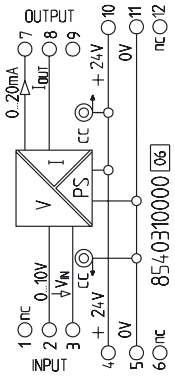
- 3-way-isolation
- analogue signal conditioning
- indication LED
- cross-connectable voltage supply via cross-connectors

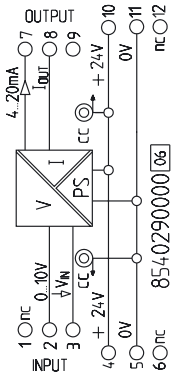
Approvals:

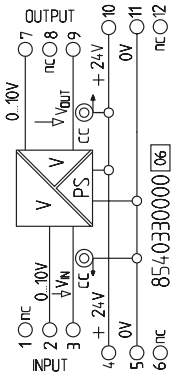
CE cULus

	VCC	VCC	VVC
	0 ... 10 V / 0 ... 20 mA	0 ... 10 V / 4 ... 20 mA	0 ... 10 V / 0 ... 10 V

Block diagram







Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS5 VCC	**8540310000**	WAS5 VCC	**8540290000**	WAS5 VVC	**8540330000**
Tension clamp connection	WAZ5 VCC	**8540320000**	WAZ5 VCC	**8540300000**	WAZ5 VVC	**8540340000**
Input/output	0 ... 10 V / 0 ... 20 mA		0 ... 10 V / 4 ... 20 mA		0 ... 10 V / 0 ... 10 V	

Technical data*			
Input signal	0 ... 10 V	0 ... 10 V	0 ... 10 V
Input voltage max.	15 V	15 V	15 V
Input resistance	typ. 100 kΩ	typ. 100 kΩ	typ. 100 kΩ
Output signal	0 ... 20 mA	4 ... 20 mA	0 ... 10 V
Load resistance	≤ 600 Ω	≤ 600 Ω	≥ 1 kΩ
Accuracy at Tu=23 °C	0.2%	0.2%	0.2%
Temperature coefficient	± 250 ppm / K	± 250 ppm / K	± 250 ppm / K
Response time	≤ 45 ms	≤ 45 ms	≤ 45 ms
Cut-off frequeny (-3 dB)	10 Hz	10 Hz	10 Hz

General			
Voltage supply	24 Vdc ±25% (18 Vdc ... **24 Vdc** ... 30 Vdc)	24 Vdc ±25% (18 Vdc ... **24 Vdc** ... 30 Vdc)	24 Vdc ±25%) (18 Vdc ... **24 Vdc** ... 30 Vdc)
Power consumption	< 1.5 W at I_{out} = 20 mA	< 1.5 W at I_{out} = 20 mA	< 1.3 W at I_{out} = 5 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C when mounted horizontally	0 °C ... +55 °C when mounted horizontally	0 °C ... +55 °C when mounted horizontally
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, cUL	CE, cUL	CE, cUL

Coordination of insulation according to EN 50178, 04/98			
Rated voltage	300 V	300 V	300 V
Rated surge voltage	4 kV	4 kV	4 kV
Overvoltage category	III	III	III
Contamination class	2	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm	≥ 3 mm
Coupling capacity			
Input / output to supply	1 nF	1 nF	1 nF
Isolation voltage, voltage strength			
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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DC/DC Signal Conditioners

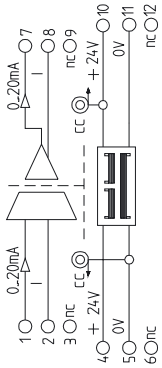
WAVEANALOG DC/DC 20 kHz

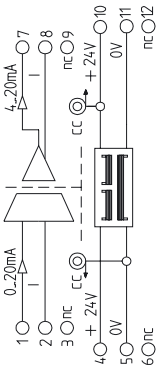
- **3-way-isolation**
- **transmission frequency 20 kHz**
- **analogue signal conditioning**
- **cross-connectable voltage supply via cross-connectors**

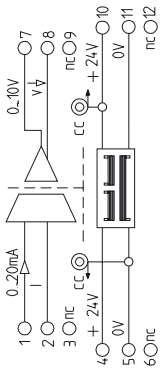
Approvals:

CCC HF	CCC HF	CVC HF
0 ... 20 mA / 0 ... 20 mA	0 ... 20 mA / 4 ... 20 mA	0 ... 20 mA / 0 ... 10 V

Block diagram







Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS5 CCC HF	**8447160000***	WAS5 CCC HF	**8447190000**	WAS5 CVC HF	**8447220000**
Tension clamp connection	WAZ5 CCC HF	**8447170000***	WAZ5 CCC HF	**8447200000**	WAZ5 CVC HF	**8447230000**
Input/output	0 ... 20 mA / 0 ... 20 mA		0 ... 20 mA / 4 ... 20 mA		0 ... 20 mA / 0 ... 10 V	

Technical data**			
Input signal	0 ... 20 mA	0 ... 20 mA	0 ... 20 mA
Input current max	50 mA	50 mA	50 mA
Input resistance	50 Ω	50 Ω	50 Ω
Output signal	0 ... 20 mA	4 ... 20 mA	0 ... 10 V
Load resistance	≤ 500 Ω	≤ 500 Ω	≥ 2 kΩ
Accuracy at Tu=23 °C	< 0.2% of FS	< 0.2% of FS	< 0.2% of FS
Temperature coefficient	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS
Response time	≤ 40 µs (typ. 30 µs)	≤ 40 µs (typ. 30 µs)	≤ 40 µs (typ. 30 µs)
Cut-off frequeny (-3 dB)	≥ 15 kHz (typ. 20 kHz)	≥ 15 kHz (typ. 20 kHz)	≥ 15 kHz (typ. 20 kHz)

General			
Voltage supply	24 Vdc ±25% (18 ... 30 Vdc)	24 Vdc ±25% (18 ... 30 Vdc)	24 Vdc ±25% (18 ... 30 Vdc)
Power consumption	< 1.5 W at I_{out} = 20 mA	< 1.5 W at I_{out} = 20 mA	< 1.3 W at I_{out} = 5 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C	0 °C ... +55 °C	0 °C ... +55 °C
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, UL, CSA	CE, UL, CSA	CE, UL, CSA

Coordination of insulation according to EN 50178, 04/98			
Rated voltage	300 V	300 V	300 V
Rated surge voltage	4 kV	4 kV	4 kV
Overvoltage category	III	III	III
Contamination class	2	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm	≥ 3 mm
Coupling capacity			
Input / output to supply	1 nF	1 nF	1 nF
Isolation voltage, voltage strength			
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308	Page 298 + 308

**T_U = 23 °C single module

* Input/output 4 ... 20 mA/4 ... 20 mA possible

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DC/DC Signal Conditioners

WAVEANALOG DC/DC 20 kHz

- **3-way-isolation**
- **transmission frequency 20 kHz**
- **analogue signal conditioning**
- **cross-connectable voltage supply via cross-connectors**

CCC HF

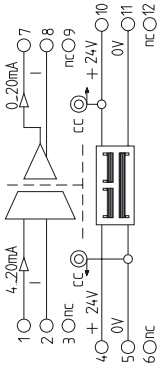
4 ... 20 mA / 0 ... 20 mA

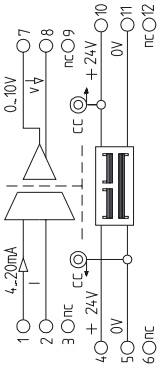
CVC HF

4 ... 20 mA / 0 ... 10 V

Approvals:

Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS5 CCC HF	**8447250000**	WAS5 CVC HF	**8447280000**
Tension clamp connection	WAZ5 CCC HF	**8447260000**	WAZ5 CVC HF	**8447290000**
Input/output	4 ... 20 mA / 0 ... 20 mA		4 ... 20 mA / 0 ... 10 V	

Technical data*		
Input signal	4 ... 20 mA	4 ... 20 mA
Input current max	50 mA	50 mA
Input resistance	50 Ω	50 Ω
Output signal	0 ... 20 mA	0 ... 10 V
Load resistance	≤ 500 Ω	≥ 2 kΩ
Accuracy at Tu=23 °C	< 0.2% of FS	< 0.2% of FS
Temperature coefficient	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS
Response time	≤ 40 µs (typ. 30 µs)	≤ 40 µs (typ. 30 µs)
Cut-off frequeny (-3 dB)	≥ 15 kHz (typ. 20 kHz)	≥ 15 kHz (typ. 20 kHz)

General		
Voltage supply	24 Vdc ±25% (18 ... 30 Vdc)	24 Vdc ±25% (18 ... 30 Vdc)
Power consumption	< 1.5 W at I_{out} = 20 mA	< 1.3 W at I_{out} = 5 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C	0 °C ... +55 °C
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, UL, CSA	CE, UL, CSA

Coordination of insulation according to EN 50178, 04/98		
Rated voltage	300 V	300 V
Rated surge voltage	4 kV	4 kV
Overvoltage category	III	III
Contamination class	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm
Coupling capacity		
Input / output to supply	1 nF	1 nF
Isolation voltage, voltage strength		
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082 EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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DC/DC Signal Conditioners

WAVEANALOG DC/DC 20 kHz

- **3-way-isolation**
- **transmission frequency 20 kHz**
- **analogue signal conditioning**
- **cross-connectable voltage supply via cross-connectors**

VCC HF

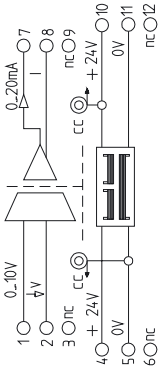
0 ... 10 V / 0 ... 20 mA

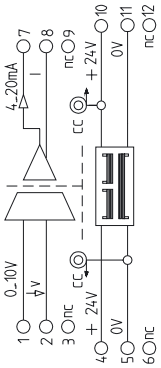
VCC HF

0 ... 10 V / 4 ... 20 mA

Approvals:

Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS5 VCC HF	**8447310000**	WAS5 VCC HF	**8447340000**
Tension clamp connection	WAZ5 VCC HF	**8447320000**	WAZ5 VCC HF	**8447350000**
Input/output	0 ... 10 V / 0 ... 20 mA		0 ... 10 V / 4 ... 20 mA	

Technical data*		
Input signal	0 ... 10 V	0 ... 10 V
Input voltage max.	15 V	15 V
Input resistance	500 kΩ	500 kΩ
Output signal	0 ... 20 mA	4 ... 20 mA
Load resistance	≤ 500 Ω	≤ 500 Ω
Accuracy at Tu=23 °C	± 0.2% of FS	± 0.2% of FS
Temperature coefficient	≤ 250 ppm / K of FS	≤ 250 ppm / K of FS
Response time	≤ 40 µs (typ. 30 µs)	≤ 40 µs (typ. 30 µs)
Cut-off frequeny (-3 dB)	≥ 15 kHz (typ. 20 kHz)	≥ 15 kHz (typ. 20 kHz)

General		
Voltage supply	24 Vdc ±25% (18 ... 30 Vdc)	24 Vdc ±25% (18 ... 30 Vdc)
Power consumption	< 1.5 W at I_{out} = 20 mA	< 1.5 W at I_{out} = 20 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C	0 °C ... +55 °C
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, UL, CSA	CE, UL, CSA

Coordination of insulation according to EN 50178, 04/98		
Rated voltage	300 V	300 V
Rated surge voltage	4 kV	4 kV
Overvoltage category	III	III
Contamination class	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm
Coupling capacity		
Input / output to supply	1 nF	1 nF
Isolation voltage, voltage strength		
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082 EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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NEW

WAVEANALOG DC/DC 20 kHz

- 3-way-isolation
- transmission frequency 20 kHz
- analogue signal conditioning
- cross-connectable voltage supply via cross-connectors

VVC HF

0 ... 10 V / 0 ... 10 V

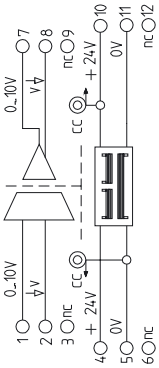
Approvals:

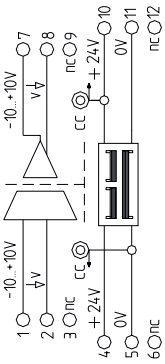
VVC HF

-10 ... +10 V / -10 ... +10 V

Approvals:

Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection	WAS5 VVC HF	**8447370000**	WAS5 VVC HF	**8561610000**
Tension clamp connection	WAZ5 VVC HF	**8447380000**	WAZ5 VVC HF	**8587000000**
Input/output	0 ... 10 V / 0 ... 10 V		±10 V / ±10V	

Technical data*		
Input signal	0 ... 10 V	-10 ... + 10 V
Input voltage max.	15 V	± 15 V
Input resistance	500 kΩ	500 kΩ
Output signal	0 ... 10 V	-10 ... + 10 V
Load resistance	≥ 2 kΩ	≥ 2 kΩ
Accuracy at Tu=23 °C	± 0.2% of FS	± 0.2% of measurement range
Temperature coefficient	≤ 250 ppm / K of FS	≤ 250 ppm / K of measurement range
Response time	≤ 40 µs (typ. 30 µs)	≤ 40 µs (typ. 30 µs)
Cut-off frequeny (-3 dB)	≥ 15 kHz (typ. 20 kHz)	≥ 15 kHz (typ. 20 kHz)

General		
Voltage supply	24 Vdc ±25% (18 ... 30 Vdc)	24 Vdc ±25% (18 ... 30 Vdc)
Power consumption	< 1.3 W at I_{out} = 5 mA	< 1.3 W at I_{out} = 5 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C	0 °C ... +55 °C
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C
Dimensions L / H / W mm	92.4 / 112.5 / 17.5	92.4 / 112.5 / 17.5
Approvals	CE, UL, CSA	CE, cUL

Coordination of insulation according to EN 50178, 04/98		
Rated voltage	300 V	300 V
Rated surge voltage	4 kV	4 kV
Overvoltage category	III	III
Contamination class	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm
Coupling capacity		
Input / output to supply	1 nF	1 nF
Isolation voltage, voltage strength		
Input/output to mounting rail	4 kV_{eff} / 1 min	4 kV_{eff} / 1 min
Standards/specifications	EN 50178	EN 50178
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

*T_U = 23 °C single module

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DC/DC Signal Conditioners (Configurable)

NEW

WAVEANALOG PRO DC/DC

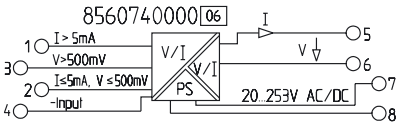
- **universally adjustable via DIP switch**
- **adjustment help via Internet**
- **3-way-isolation**
- **voltage supply from 20 - 230 V ac/dc**
- **low power loss**
- **adjustable transmission frequency**
- **indication LED**

Approvals:

CE cULus GL

Block diagram

PRO DC/DC



Ordering data	Type	Cat. No.
Screw connection	WAS4 PRO DC/DC	**8560740000**
Tension clamp connection	WAZ4 PRO DC/DC	**8560750000**
Input/output	configurable	

Technical data*	
Input (adjustable)	
Voltage uni-/bipolar adjustable	20 mV ... 200 V
Voltage calibrated ranges	0 … ±60 mV, 0 … ±100 mV, 0 … ±150 mV, 0 … ±300 mV, 0 … ±500 mV, 0 … ±1V, 0 … ±5V, 0 … ±10 V, 0 … ±100 V
Current uni-/bipolar adjustable	0.1 mA ... 100 mA
Current calibrated ranges	0 … ±0.3 mA, 0 … ±1 mA, 0 … ±5 mA, 0 … ±16 mA, 0 … 20 mA, 0 … 50 mA
Input resistance	
at current input range < 5 mA / > 5 mA	approx. 100 Ω / approx. 5 Ω
at voltage input	approx. 1 MΩ
Input capacity	
at current input	approx. 1 nF
Voltage input range < 500 mV / > 500 mV	approx. 1 nF / approx. 500 pF
Overload capacity	
at current input range < 5 mA / > 5 mA	< 75 mA / < 300 mA
Voltage input range < 500 mV / > 500 mV	max. < 20 mA / < 3 mA continuous current
Output (adjustable)	
Voltage uni-/bipolar adjustable	0 … 10 V
Voltage calibrated ranges	0 … ±10 V, 2 … 10 V, 0 … ±5 V, 1 … 5 V
Current uni-/bipolar adjustable	0 … 20 mV
Current calibrated ranges	0 … ±20 mA, 4 … 20 mA
Offset	-100%, -50%, 0%, 50%, 100% of measuring span of the chosen output range
Load	
at output current	< 12 V (600 Ω at 20 mA)
at output voltage	< 10 mA (1 KΩ at 10 V)
Offset	20 µA and. 10 mV
Residual ripple	< 10 mVeff
Adjustment zero pot.	+25% measuring span of the chosen output range
Adjustment span pot.	0.33 ... 3.30 x end value of chosen input range
Gain error	< 0.1% of FS
Temperature coefficient	< 60 ppm/K of FS
Cut-off frequeny	> 10 kHz, < 10 Hz switch
General	
Voltage supply	20 ... 230 V ac/dc +10%
Power consumption	approx. 1 W
Frequency range	48 ... 62 Hz
Operating temperature	-10 °C ... +70 °C
Storage temperature	-40 °C ... +85 °C
Factory setting	0 ... 10 V / 0 ... 10 V 10 Hz
Dimensions L/H/B mm	92.4 / 112.5 / 12.5
Weight	approx. 100 g
Approvals	CE, cUL, GL
Coordination of insulation according to EN 50178, 04/98	
Rated voltage	600 V
Rated surge voltage	5 kV, 1.2/50 us, acc. to IEC 255-4
Overvoltage category	III
Contamination class	2
Test voltage	4 KV_{eff} input against output against auxiliary power
Standards/specifications	EN 50178
EMC standards	DIN EN 61326, EN 61326/A1, EN 50081-2, EN 61000-6-2

Adjustment help WAVETOOL

The service tool enables quick and uncomplicated configuration of WAVEANALOG PRO.
Download from Internet:
http://www.weidmueller.de
→ Products → Downloads (see page 192)

Switch position/setting options

Input	Switch S1				Switch S2			
Input range	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
0 … ±60 mV								■
0 … ±100 mV	■							■
0 … ±150 mV		■						■
0 … ±300 mV	■	■						■
0 … ±500 mV			■					■
0 … ±1 V	■		■			■		■
0 … ±5 V		■	■			■		■
0 … ±10 V	■	■	■			■		■
0 … ±100 V				■			■	■
0 … ± ~0.3 mA	■			■	■			■
0 … ±1 mA		■		■	■			■
0 … ±5 mA	■	■		■	■			■
0 … ±10 mA			■	■	■			■
0 … ±20 mA	■		■	■	■			■
0 … ±50 mA		■	■	■	■			■
0 … ±20 mA*	■	■	■	■	■			■

*Offset conversion not calibrated

	Switch S2	4
calibrated ranges		■

Span pot. activated: input range x 0.33 ... x 3.30

Output	Switch S1			Switch S3	
Output range	**5**	**6**	**7**	**1**	**2**
0 … ±10 V				■	■
2 … 10 V	■			■	■
0 … ±5 V		■		■	■
1 … 5 V	■	■		■	■
0 … ±20 mA			■		
4 … 20 mA	■		■		

Offset	S1			S2
(in % of output voltage)	**8**	**9**	**10**	**5**
0 %				■
-100 %	■			■
-50 %		■		■
+50 %	■	■		■
+100 %			■	■

Zero pot. activated: additional ±25 %

	Switch S3	3
Bandwidth 10 kHz		
Bandwidth 10 Hz		■

Set range can be documented on side of housing.

■ = on
= off

Dimensions and accessories see page 298 + 308

*T_U = 23 °C single module

Analogue Signal Processing

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RTD Signal Conditioners

WAVEANALOG RTD

- **2-wire technology**
- **configurable temperature range -200 °C ... +800 °C**
- **Configurable output current range 0 ... 20 mA / 4 ... 20 mA**
- **cross-connectable voltage supply via cross-connectors**

PT100/2

0(4) ... 20 mA

PT100/2

0 ... 10 V

Switch position/setting options

Tmin	1	2	3
0 C°	■	■	■
-10 C°	■	■	
-20 C°	■		■
-40 C°	■		
-60 C°		■	■
-80 C°		■	
-100 C°			■
-200 C°			

Span	4	5	6
40 … 50 °C	■	■	■
50 … 75 °C	■	■	
75 … 110 °C	■		■
110 … 165 °C	■		
165 … 245 °C		■	■
245 … 360 °C		■	
360 … 540 °C			■
540 … 800 °C			

Output[1])

Range	7
0 … 20 mA	
4 … 20 mA	■

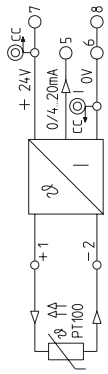
[1]) only modules with current output

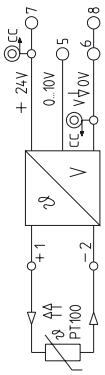
■ = on
= off

Approvals:

CE UL CSA

Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection	WTS4 PT100/2 C	**8432210000***	WTS4 PT100/2 V	**8432180000***
Tension clamp connection	WTZ4 PT100/2 C	**8432220000***	WTZ4 PT100/2 V	**8432190000***
Input/output	PT100/2 / 0(4) ... 20 mA		PT100/2 / 0 ... 10 V	

Technical data* **		
Input signal	**PT100/2-wire**	**PT100/2-wire**
Temperature range	-200 ... +800 °C	-200 ... +800 °C
Supply current	1.45 mA	1.45 mA
Conductor resistance		
Output signal	0(4) ... 20 mA	0 ... 10 V
Load resistance	≤ 500 Ω	≥ 1 kΩ
Accuracy at Tu=23 °C	± 0.5% of measurement range	± 0.5% of measurement range
Temperature coefficient		
Measurement range ≥ 200 K	≤ 200 ppm / °C (typ. 80 ppm / °C)	≤ 200 ppm / °C (typ. 80 ppm / °C)
100 K ≤ measurement range < 200 K	≤ 250 ppm / °C (typ. 100 ppm / °C)	≤ 250 ppm / °C (typ. 100 ppm / °C)
40 K ≤ measurement range < 100 K	≤ 500 ppm / °C	≤ 500 ppm / °C
General		
Voltage supply	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)
Power consumption	< 48 mA at I_{out} = 20 mA	< 38 mA at I_{out} = 10 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C	0 °C ... +55 °C
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C
Standards/specifications	EN 50178, IEC 751	EN 50178, IEC 751
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions L / H / W mm	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5
Approvals	CE, UL, CSA	CE, UL, CSA
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

* without balancing

*** T_U = 23 °C single module

Preconfigured modules

	Input	Output 0 … 20 mA	Output 4 … 20 mA	Output 0 … 10 V
Screw connection	0 … 100 °C	**8432210001**	**8432210011**	**8432180001**
	special balancing	**8432219999****	**8432219999****	**8432189999****
Tension clamp connection	0 … 100 °C	**8432220001**	**8432220011**	**8432190001**
	special balancing	**8432229999****	**8432229999****	**8432199999****

**You must indicate the temperature range when ordering
Please indicate additional output signal of current output

Aids

- Voltage supply 24 Vdc, 50 mA
- Simulator for PT 100 or precision-resistance-decade
- Ampere-/voltmeter which can be calibrated to an accuracy of >0.1 % of the end value.

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RTD Signal Conditioners

WAVEANALOG RTD

- **3-wire technology**
- **configurable temperature range -200 °C ... +800 °C**
- **configurable output current range 0 ... 20 mA / 4 ... 20 mA**
- **cross-connectable voltage supply via cross-connectors**

Approvals:

PT100/3

0(4) ... 20 mA

PT100/3

0 ... 10 V

Switch position/setting options

Tmin	1	2	3
0 C°	■	■	■
-10 C°	■	■	
-20 C°	■		■
-40 C°	■		
-60 C°		■	■
-80 C°		■	
-100 C°			■
-200 C°			

Span	4	5	6
40 … 50 °C	■	■	■
50 … 75 °C	■	■	
75 … 110 °C	■		■
110 … 165 °C	■		
165 … 245 °C		■	■
245 … 360 °C		■	
360 … 540 °C			■
540 … 800 °C			

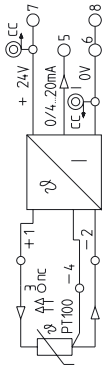
Output[1])

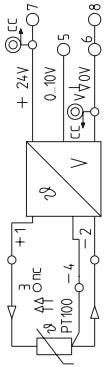
Range	7
0 … 20 mA	
4 … 20 mA	■

[1]) only modules with current output

■ = on
= off

Block diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection	WTS4 PT100/3 C	**8432150000***	WTS4 PT100/3 V	**8432090000***
Tension clamp connection	WTZ4 PT100/3 C	**8432160000***	WTZ4 PT100/3 V	**8432130000***
Input/output	PT100/3 / 0(4) ... 20 mA		PT100/3 / 0 ... 10 V	

Technical data* **		
Input signal	PT100/3-wire	PT100/3-wire
Temperature range	-200 ... +800 °C	-200 ... +800 °C
Supply current	1.45 mA	1.45 mA
Conductor resistance	≤ 50 Ω	≤ 50 Ω
Output signal	0(4) ... 20 mA	0 ... 10 V
Load resistance	≤ 500 Ω	≥ 1 kΩ
Accuracy at Tu=23 °C	± 0.5% of measurement range	± 0.5% of measurement range
Temperature coefficient		
Measurement range ≥ 200 K	≤ 200 ppm / °C (typ. 80 ppm / °C)	≤ 200 ppm / °C (typ. 80 ppm / °C)
100 K ≤ measurement range < 200 K	≤ 250 ppm / °C (typ. 100 ppm / °C)	≤ 250 ppm / °C (typ. 100 ppm / °C)
40 K ≤ measurement range < 100 K	≤ 500 ppm / °C (typ. 200 ppm / °C)	≤ 500 ppm / °C (typ. 200 ppm / °C)

General		
Voltage supply	24 Vdc ±20% (19.2 ... 28.8 Vdc)	24 Vdc ±20% (19.2 ... 28.8 Vdc)
Power consumption	< 48 mA at I_{out} = 20 mA	< 38 mA at I_{out} = 10 mA
Current carrying capacity of cross-connection	≤ 2 A	≤ 2 A
Operating temperature	0 °C ... +55 °C	0 °C ... +55 °C
Storage temperature	-20 °C ... +85 °C	-20 °C ... +85 °C
Standards/specifications	EN 50178, IEC 751	EN 50178, IEC 751
EMC standards	EN 50081, EN 50082, EN 55011	EN 50081, EN 50082, EN 55011
Dimensions L / H / W mm	92.4 / 112.5 / 12.5	92.4 / 112.5 / 12.5
Approvals	CE, UL, CSA	CE, UL, CSA
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

* without balancing

*** T_U = 23 °C single module

Preconfigured modules

		Output		
	Input	0 … 20 mA	4 … 20 mA	0 … 10 V
Screw connection	0 … 100 °C	**8432150001**	**8432150011**	**8432090001**
	special balancing	**8432159999****	**8432159999****	**8432099999****
Tension clamp connection	0 … 100 °C	**8432160001**	**8432160011**	**8432130001**
	special balancing	**8432169999****	**8432169999****	**8432139999****

** You must indicate the temperature range when ordering
Please indicate additional output signal of current output

Aids

- Voltage supply 24 Vdc, 50 mA
- Simulator for PT 100 or precision-resistance-decade
- Ampere-/voltmeter which can be calibrated to an accuracy of >0.1 % of the end value.

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RTD Signal Conditioners

WAVEANALOG RTD

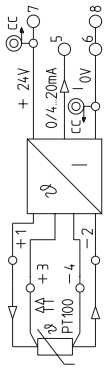
- **2-, 3- and 4-wire technology**
- **configurable temperature range -200 °C ... +800 °C**
- **configurable output current range 0 ... 20 mA / 4 ... 20 mA**
- **cross-connectable voltage supply via cross-connectors**

Approvals:

Block diagram

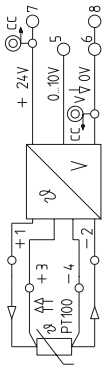
PT100/4

0(4) ... 20 mA



PT100/4

0 ... 10 V



Switch position/setting options

Tmin	1	2	3
0 C°	■	■	■
-10 C°	■	■	
-20 C°	■		■
-40 C°	■		
-60 C°		■	■
-80 C°		■	
-100 C°			■
-200 C°			

Span	4	5	6
40 … 50 °C	■	■	■
50 … 75 °C	■	■	
75 … 110 °C	■		■
110 … 165 °C	■		
165 … 245 °C		■	■
245 … 360 °C		■	
360 … 540 °C			■
540 … 800 °C			

Output [1]

Range	7
0 … 20 mA	
4 … 20 mA	■

PT 100

	8	9	10
2 - wire	■	■	■
3 - wire		■	■
4 - wire			■

[1] only modules with current output

■ = on
= off

Ordering data	Type	Cat. No.	Type	Cat. No.
Screw connection	WTS4 PT100/4 C	**8432270000***	WTS4 PT100/4 V	**432240000***
Tension clamp connection	WTZ4 PT100/4 C	**8432280000***	WTZ4 PT100/4 V	**432250000***
Input/output	PT100/4 / 0(4) ... 20 mA		PT100/4 / 0 ... 10 V	
Technical data* **				
Input signal	PT100/4-wire		PT100/4-wire	
Temperature range	-200 ... +800 °C		-200 ... +800 °C	
Supply current	1.45 mA		1.45 mA	
Conductor resistance	≤ 50 Ω (3- & 4-wire)		≤ 50 Ω (3- & 4-wire)	
Output signal	0(4) ... 20 mA		0 ... 10 V	
Load resistance	≤ 500 Ω		≥ 1 kΩ	
Accuracy at Tu=23 °C				
100 K ≤ measurement range < 600 K	± 0.1% of measurement range		± 0.1% of measurement range	
Measurement range ≤ 100 K	± 0.1 K		± 0.1 K	
Measurement range ≥ 600 K	± 0.2% of measurement range		± 0.2% of measurement range	
Temperature coefficient				
Measurement range ≥ 200 K	≤ 200 ppm / °C (typ. 80 ppm / °C)		≤ 200 ppm / °C (typ. 80 ppm / °C)	
100 K ≤ measurement range < 200 K	≤ 225 ppm / °C (typ. 90 ppm / °C)		≤ 225 ppm / °C (typ. 90 ppm / °C)	
40 K ≤ measurement range < 100 K	≤ 450 ppm / °C (typ. 180 ppm / °C)		≤ 450 ppm / °C (typ. 180 ppm / °C)	
General				
Voltage supply	24 Vdc ±20% (19.2 ... 28.8 Vdc)		24 Vdc ±20% (19.2 ... 28.8 Vdc)	
Power consumption	< 48 mA at I_{out} = 20 mA		< 38 mA at I_{out} = 10 mA	
Current carrying capacity of cross-connection	≤ 2 A		≤ 2 A	
Operating temperature	0 °C ... +55 °C		0 °C ... +55 °C	
Storage temperature	-20 °C ... +85 °C		-20 °C ... +85 °C	
Standards/specifications	EN 50178, IEC 751		EN 50178, IEC 751	
EMC standards	EN 50081, EN 50082, EN 55011		EN 50081, EN 50082, EN 55011	
Dimensions L / H / W mm	92.4 / 112.5 / 12.5		92.4 / 112.5 / 12.5	
Approvals	CE, UL, CSA		CE, UL, CSA	
Dimensions and accessories see	Page 298 + 308		Page 298 + 308	

* without balancing

*** T_U = 23 °C single module

Preconfigured modules

	Input	Output 0 … 20 mA	Output 4 … 20 mA	Output 0 … 10 V
Screw connection	0 … 100 °C	**8432270001**	**8432270011**	**8432240001**
	special balancing	**8432279999****		**8432249999****
Tension clamp connection	0 … 100 °C	**8432280001**	**8432280011**	**8432250001**
	special balancing	**8432289999****		**8432259999****

** Please indicate the temperature range and the sensor type (2-, 3- or 4-wire).
Please indicate additional output signal of current output

Aids

- Voltage supply 24 Vdc, 50 mA
- Simulator for PT 100 or precision-resistance-decade
- Ampere-/voltmeter which can be calibrated to an accuracy of >0.1 % of the end value.

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RTD-Signal Isolating Transformer (Configurable)

NEW

WAVEANALOG PRO RTD

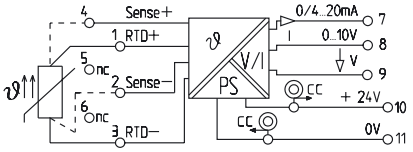
- **measurement from PT 100, Ni 100, R, potentiometer**
- **univerally adjustable via DIP switch**
- **3-way-isolation**
- **status LED**
- **linearization**
- **cross-connectable voltage supply via cross-connectors**

Approvals:

PRO RTD

Adjustment help WAVETOOL
This service tool enables quick and uncomplicated configuration of WAVEANALOG PRO. Download from Internet: http: //www.weidmueller.de → Products → Downloads (see page 192)

Block diagram



Ordering data	Type	Cat. No.
Screw connection	WAS5 PRO RTD	**8560700000**
Tension clamp connection	WAZ5 PRO RTD	**8560710000**
Input/output	configurable	

Technical data*			
Input (adjustable)	PT100/2-/3-/4-wire: -200°C to 850°C		
	Ni100 : -60°C to +250°C		
	Potentiometer: min: 0…100Ω / max:0…100kΩ		
	Resistance: 0 ... 450Ω /		
Output (adjustable)			
Output voltage	0...10 V		
Offset voltage	max. 0.05 V		
Load resistance	≥ 1 kΩ		
Output current	0/4 ... 20 mA		
Offset current	max. 100 µA		
Load resistance	≤ 600 Ω		
Accuracy, slow/fast step response	PT 100,Ni 100: 0.3% of measurement range 0.8%,		
	Measurement range < 100 K / 0.3 K / 0.8 K		
	Potentiometer: 0.2% of FS / 0.3%		
	Resistance: 0.2% of FS / 0.3%		
Step response (switchable via DIP switch)	typ.	fast	slow
RTD, R		< 1.2 s	< 2.2 s
Potentiometer		< 500 ms	< 1.1 s
Temperature coefficient	measurement range ≥ 200 K	≤ 200 ppm / °C	
	100 K ≤ measurement range < 200 K	≤ 250 ppm / °C	
	40 K ≤ measurement range < 100 K	≤ 400 ppm / °C	
Max. wire resistance:	50 Ω for 3- and 4-wire		
Influence of wire resistances:	max. + 0.25°C at 50 Ω wire resistance		
Open circuit recognition:	Output signal > 10 V or > 20 mA, LED blinks		
Range of man. fine adjustment	≥ ± 5%, from ver. 1: ≥12.5%, potentiometer ≥ 12.5 %…25 %		
Status LED:	Module active: LED lit / open circuit: LED blinks		
	Error: LED off		
General			
Supply voltage	18 Vdc ... 24 Vdc ... 30 Vdc		
Power consumption	830 mW ... 880 mW ... 980mW @ I_{out} = 20 mA		
Current carrying capacity of cross-connection	≤ 2 A		
Operating temperature	0...55°C		
Storage temperature	-20...85°C		
Factory setting	PT 100/3 0 ... 100 °C / 4 ... 20 mA		
	No manual fine adjustment; slow step response		
Dimensions L/H/B mm	92.4 / 112.5 / 17.5		
Weight	approx. 100 g		
Approvals	CE, cUL, GL		
Coordination of insulation according to DIN EN 50178, 04/98			
Rated voltage	300 V		
Surge voltage	4 kV		
Overvoltage category	III		
Contamination class	2		
Clearance and creepage distance	3 mm		
Test voltage	2 kV_{eff}		
Standards/specifications	EN 50178, IEC751		
EMC standards	EN 50081, EN50082, EN55011		
Dimensions and accessories see	Page 298 + 308		

* T_U = 23 °C single module

Selection of input

Input	Switch 1		
	1	2	3
PT100 2-wire	■	■	■
PT100 3-wire		■	■
PT100 4-wire.	■		■
R 2-wire			■
NI100 2-wire	■	■	
NI100 3-wire		■	
NI100 4-wire	■		
Potentiometer			

■ = on
= off

Selection of minimum input values

ϑ_{min}	R_{min}	Pot.min	Switch 1			
			4	5	6	7
0°C	0 Ω	0%	■	■	■	■
-10°C	10 Ω	10%	■	■	■	
-20°C	20 Ω	20%	■	■		■
-25°C	20 Ω	25%	■	■		
-30°C	30 Ω	30%	■		■	■
-40°C	40 Ω	40%	■		■	
-50°C	50 Ω	50%	■			■
-60°C	60 Ω	60%	■			
-70°C	70 Ω	70%		■	■	■
-80°C	80 Ω	80%		■	■	
-90°C	90 Ω			■		■
-100°C	100 Ω			■		
-150°C	150 Ω				■	■
-200°C	200 Ω				■	
						■
Special range						

Selection of the measurement range

T	R	pot.	Switch 2				
			1	2	3	4	5
40K	20Ω	20%	■	■	■	■	■
50K	25Ω	25%	■	■	■	■	
60K	30Ω	30%	■	■	■		■
70K	35Ω	35%	■	■	■		
80K	40Ω	40%	■	■		■	■
90K	45Ω	45%	■	■		■	
100K	50Ω	50%	■	■			■
110K	55Ω	55%	■	■			
120K	60Ω	60%	■		■	■	■
125K	62.5Ω	62.5%	■		■	■	
130K	65Ω	65%	■		■		■
140K	70Ω	70%	■		■		
150K	75Ω	75%	■			■	■
160K	80Ω	80%	■			■	
170K	85Ω	85%	■				■
180K	90Ω	90%	■				
190K	95Ω	95%		■	■	■	■
200K	100Ω	100%		■	■	■	
250K	125Ω	---		■	■		■
300K	150Ω	---		■	■		
350K	175Ω	---		■		■	■
400K	200Ω	---		■		■	
450K	225Ω	---		■			■
500K	250Ω	---		■			
550K	275Ω	---			■	■	■
600K	300Ω	---			■	■	
650K	325Ω	---			■		■
700K	350Ω	---			■		
750K	375Ω	---				■	■
800K	400Ω	---				■	
850K	425Ω	---					■
900K	450Ω	---					

Selection of output

Output	Switch 2	
	6	7
0...10V	■	
0...20mA		
4...20mA		■

Switching on the manual fine adjustment

	S.1
man. adj..	8
off	
on	■

Selection of step set time

Time of step response	S.2
	8
slow	■
fast	

Analogue Signal Processing

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Thermo-Signal Conditioners

WAVEANALOG Thermo

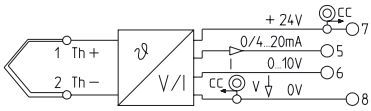
- **thermocouples K, J, T, E, N, R, S, B configurable**
- **temperature range -200 °C ... +1820 °C**
- **no adjustment necessary**
- **cold junction compensation**
- **configurable output signal**
- **cross-connectable voltage supply via cross-connectors**

Approvals:

Thermo Select

°C / 0 ... 20 mA,
4 ... 20 mA, 0 ... 10 V

Block diagram



Ordering data	Type	Cat. No.
Screw connection	WTS4 Thermo Select	**8432300000**
Tension clamp connection	WTZ4 Thermo Select	**8432310000**
Input/output	°C / 0 ... 20 mA	
	°C / 4 ... 20 mA	
	°C / 0 ... 10 V	

Technical data*	
Input signal	Thermocoupler acc. to IEC584 (fully insulated)
Types	K -200 ... +1372 °C
	J -200 ... +1200 °C
	T -200 ... +400 °C
	E -200 ... +1000 °C
	N -200 ... +1300 °C
	R -50 ... +1760 °C
	S -50 ... +1760 °C
	B +50 ... +1820 °C
Output signal	0 ... 20 mA
Load resistance	≤ 500 Ω
Output signal	4 ... 20 mA
Load resistance	≤ 500 Ω
Output signal	0 ... 10 V
Load resistance	≥ 1 kΩ
Accuracy at Tu = 23 °C	Type K -200°C ...-150°C ± (5K + 0.1% of set range)
	-150°C ...1200°C ± (3K + 0.1% of set range)
	1200°C ...1372°C ± (4K + 0.1% of set range)
	Type J -200°C ...-150°C ± (4K + 0.1% of set range)
	-150°C ...1200°C ± (3K + 0.1% of set range)
	Type T -200°C ...-150°C ± (5K + 0.1% of set range)
	-150°C ...400°C ± (3K + 0.1% of set range)
	Type E -200°C ...-150°C ± (4K + 0.1% of set range)
	-150°C ...1000°C ± (3K + 0.1% of set range)
	Type N -200°C ...-150°C ± (6K + 0.1% of set range)
	-150°C ...1300°C ± (3K + 0.1% of set range)
	Type R -50°C ...200°C ± (10K + 0.1% of set range)
	200°C ...1760°C ± (6K + 0.1% of set range)
	Type S -50°C ...200°C ± (10K + 0.1% of set range)
	200°C ...1760°C ± (6K + 0.1% of set range)
	Type B 50°C ...250°C ± (25K + 0.1% of set range)
	250°C ...500°C ± (10K + 0.1% of set range)
	500°C ...1820°C ± (6K + 0.1% of set range)
Temperature coefficient	± (200 ppm v. Span
	+ 0.075 K) /K
Response time without filter	1.1 s
Response time with filter	6 s
General	
Voltage supply	24 Vdc ±20% (19.2 ... 28.8 Vdc)
Power consumption	< 38 mA at I_{out} = 20 mA
Current carrying capacity of cross-connection	≤ 2 A
Open circuit recognition	LED blinks (output value: > 20 mA and. > 10 V)
Operating temperature	0 °C ... +55 °C
Storage temperature	-20 °C ... +85 °C
Standards/specifications	EN 50178, IEC584
EMC standards	EN 50081, EN 50082, EN 55011
Dimensions L / H / W mm	92.4 / 112.5 / 12.5
Approvals	CE, UL, CSA
Dimensions and accessories see	Page 298 + 308

* T_U = 23 °C single module

Switch position/setting options

SW 1

Type	1	2	3
K	■	■	■
J		■	■
T	■		■
E			■
N	■	■	
R		■	
S	■		
B			

SW 1

Tmin	4	5	6	7
0 C°	■	■	■	■
-10 C°	■	■	■	
-20 C°	■	■		■
-30 C°	■	■		
-40 C°	■		■	■
-50 C°	■		■	
-100 C°	■			■
-150 C°	■			
-200 C°		■	■	■
+50 C°		■	■	
+100 C°		■		■
+150 C°		■		
+200 C°			■	■
+250 C°			■	
+500 C°				■

SW 2

Output	6	7
0 - 10 V	■	
0 - 20 mA		
4 - 20 mA		■

Filter	8
off	
on	■

SW 2

Span	1	2	3	4	5
100 C°	■	■	■	■	■
150 C°	■	■	■	■	
200 C°	■	■	■		■
250 C°	■	■	■		
300 C°	■	■		■	■
350 C°	■	■		■	
400 C°	■	■			■
450 C°	■	■			
500 C°	■		■	■	■
550 C°	■		■	■	
600 C°	■		■		■
650 C°	■		■		
700 C°	■			■	■
750 C°	■			■	
800 C°	■				■
850 C°	■				
900 C°		■	■	■	■
950 C°		■	■	■	
1000 C°		■	■		■
1050 C°		■	■		
1100 C°		■		■	■
1150 C°		■		■	
1200 C°		■			■
1250 C°		■			
1300 C°			■	■	■
1350 C°			■	■	
1400 C°			■		■
1450 C°			■		
1500 C°				■	■
1600 C°				■	
1700 C°					■
1800 C°					

■ = on
= off

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Thermo Signal Isolating Transformers (Configurable)

NEW

WAVEANALOG PRO Thermo

- 3-way-isolation
- thermocouples K, J, T, E, N, R, S, B configurable
- temperature range -200 °C ... +1820 °C
- no adjustment necessary
- cold junction compensation
- configurable output signal
- cross-connectable voltage supply via cross-connectors

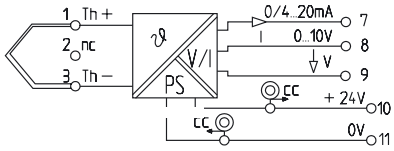
Approvals:

CE cULus GL

PRO Thermo

Adjustment help WAVETOOL
This service tool enables quick and uncomplicated configuration of WAVEANALOG PRO. Download from the Internet: http: //www.weidmueller.de → Products → Downloads (see page 192)

Block diagram



Ordering data	Type	Cat. No.
Screw connection	WAS5 PRO Thermo	**8560720000**
Tension clamp connection	WAZ5 PRO Thermo	**8560730000**
Input/output	configurable	

Technical data*	
Input (adjustable)	
	Thermocouples acc. to EN 60584-1
	Type K, J, E, N, R, S, B via DIP switch selectable
Accuracy at Tu = 23 °C	Type K -200°C ...-150°C ± (5K + 0.1% of set range)
	-150°C ...1200°C ± (3K + 0.1% of set range)
	1200°C ...1372°C ± (4K + 0.1% of set range)
	Type J -200°C ...-150°C ± (4K + 0.1% of set range)
	-150°C ...1200°C ± (3K + 0.1% of set range)
	Type T -200°C ...-150°C ± (5K + 0.1% of set range)
	-150°C ...400°C ± (3K + 0.1% of set range)
	Type E -200°C ...-150°C ± (4K + 0.1% of set range)
	-150°C ...1000°C ± (3K + 0.1% of set range)
	Type N -200°C ...-150°C ± (6K + 0.1% of set range)
	-150°C ...1300°C ± (3K + 0.1% of set range)
	Type R -50°C ...200°C ± (10K + 0.1% of set range)
	200°C ...1760°C ± (6K + 0.1% of set range)
	Type S -50°C ...200°C ± (10K + 0.1% of set range)
	200°C ...1760°C ± (6K + 0.1% of set range)
	Type B 50°C ...250°C ± (25K + 0.1% of set range)
	250°C ...500°C ± (10K + 0.1% of set range)
	500°C ...1820°C ± (6K + 0.1% of set range)
Output (adjustable)	
Output voltage	0...10 V
Offset voltage	Max. 0.05 V
Load resistance	≥ 1 KΩ
Output current	0/4 ... 20 mA
Offset current	max. 100 µA
Load resistance	≤ 600 Ω
Step response	max. 1.4 s
at connected filter function	max. 7.5 s
Max. wire resistance	50 Ω for 3- and 4-wire
Open circuit recognition	Output signal > 10 V or > 20 mA, LED blinks
Range of man. fine adjustment	≥ ±5%
Status LED:	Module active: LED lights up / open circuit: LED blinks
	Error: LED off
General	
Supply voltage:	18 Vdc ... 24 Vdc ... 30 Vdc
Power consumption:	800 mV ... 850 mW ... 950 mW @ I output = 20 mA
Current carrying capacity of cross-connection	≤ 2 A
Operating temperature	0 °C ... +55 °C
Storage temperature	-20 ... +85 °C
Standards/specifications	EN 50178, IEC751
EMC standards	EN 50081, EN50082, EN55011
Factory setting	Type K 0 ... 1000 °C / 4 ... 20 mA; no filter;
	No manual fine adjustment
Dimensions L/H/W mm	92.4 / 112.5 / 17.5
Weight	100 g
Approvals	CE, cUL, GL
Dimensions and accessories see	Page 298 + 308

* T_U = 23 °C single module

Selection the thermocoupler

Type	SW1 1	SW1 2	SW1 3
K	■	■	■
J		■	■
T	■		■
E			■
N	■	■	
R		■	
S	■		
B			

Selection of minimum temperature

ϑ_{min}	SW1 4	SW1 5	SW1 6	SW1 7
0°C	■	■	■	■
-10°C	■	■	■	
-20°C	■	■		■
-30°C	■	■		
-40°C	■		■	■
-50°C	■		■	
-100°C	■			■
-150°C	■			
-200°C		■	■	■
+50°C		■	■	
+100°C		■		■
+150°C		■		
+200°C			■	■
+250°C			■	
500°C				■
Special range				

Selection of temperature span

Span	SW2 1	SW2 2	SW2 3	SW2 4	SW2 5
100°C	■	■	■	■	■
150°C	■	■	■	■	
200°C	■	■	■		■
250°C	■	■	■		
300°C	■	■		■	■
350°C	■	■		■	
400°C	■	■			■
450°C	■	■			
500°C	■		■	■	■
550°C	■		■	■	
600°C	■		■		■
650°C	■		■		
700°C	■			■	■
750°C	■			■	
800°C	■				■
850°C	■				
900°C		■	■	■	■
950°C		■	■	■	
1000°C		■	■		■
1050°C		■	■		
1100°C		■		■	■
1150°C		■		■	
1200°C		■			■
1250°C		■			
1300°C			■	■	■
1350°C			■	■	
1400°C			■		■
1450°C			■		
1500°C				■	■
1600°C				■	
1700°C					■
1800°C					

■ = on
= off

Selection of output

Output	SW2 6	SW2 7
0...10V	■	
0...20mA		
4...20mA		■

Switching on the manual fine adjustment

man. adjust.	SW1 8
off	
on	■

Switching on the filter function

Filter	SW2 8
off	
on	■

Coordination of insulation acc. to DIN EN 50178, 04/98

Rated voltage	300 V
Surge voltage	4 kV
Overvoltage category	III
Contamination class	2
Clearance & creep. distance	3 mm
Test voltage	2 kV_{eff}

Analogue Signal Processing

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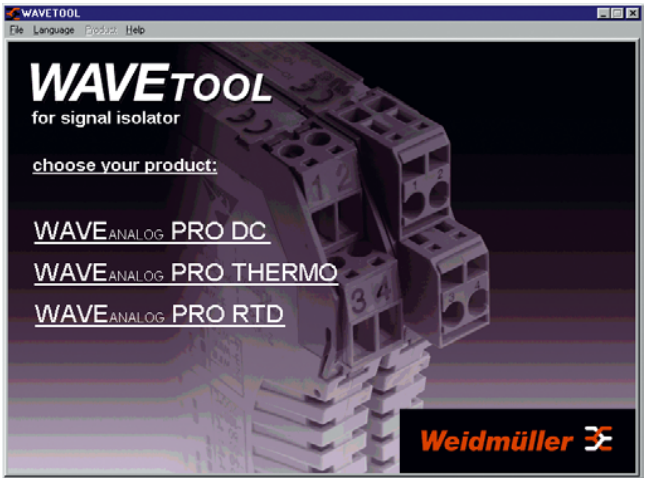
Adjustment Help WAVETOOL

NEW

The adjustment help – **WAVETOOL** –

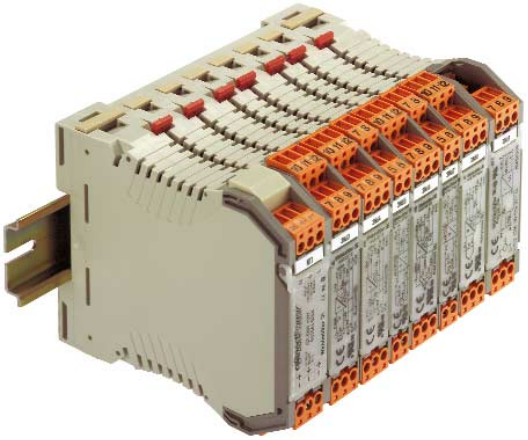
enables quick and uncomplicated configuration of
WAVEANALOG PRO DC,
WAVEANALOG PRT RTD,
WAVEANALOG PRO THERMO.

Menu for selecting the functions

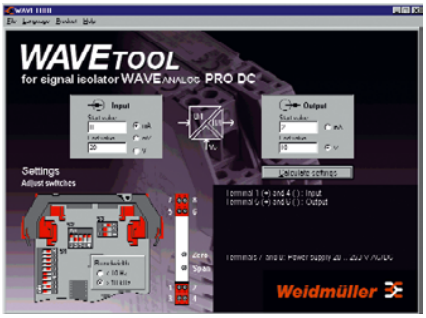


Once the required input and output parameters have been entered, the program determines the correct switch setting and gives instructions for the electrical connection of the module. Where necessary, it also determines and displays the required calibration values. The entire process can be printed out or saved as a PDF file for installation documentation purposes.

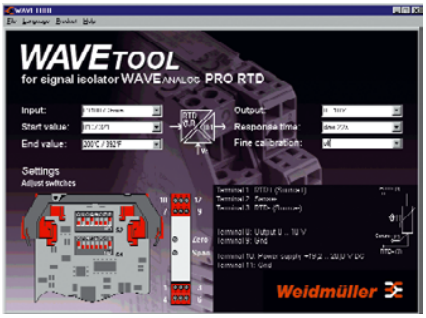
Download from the Internet:
http://www.weidmueller.de ⇨Products ⇨Download



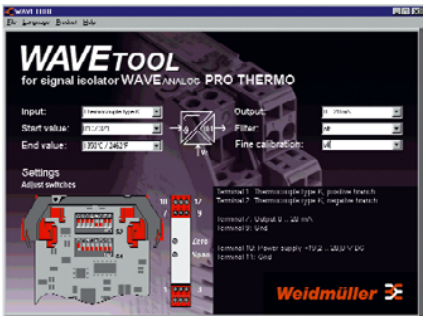
For configuring the current/voltage isolating transformer



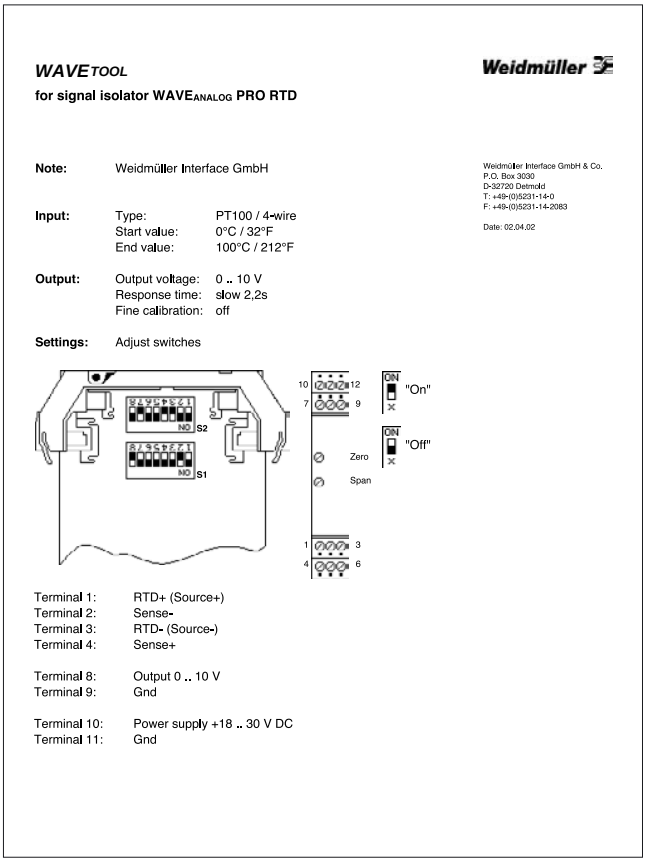
For configuring the temperature signal isolating transformer



For configuring the thermo signal isolating transformer



Printout of protocol for the documentation



WAVETOOL
for signal isolator WAVEANALOG PRO RTD

Weidmüller

Weidmüller Interface GmbH & Co.
P.O. Box 3030
D-32720 Detmold
T: +49-(0)5231-14-0
F: +49-(0)5231-14-2083

Date: 02.04.02

Note: Weidmüller Interface GmbH

Input: Type: PT100 / 4-wire
Start value: 0°C / 32°F
End value: 100°C / 212°F

Output: Output voltage: 0 .. 10 V
Response time: slow 2,2s
Fine calibration: off

Settings: Adjust switches

Terminal 1: RTD+ (Source+)
Terminal 2: Sense-
Terminal 3: RTD- (Source-)
Terminal 4: Sense+

Terminal 8: Output 0 .. 10 V
Terminal 9: Gnd

Terminal 10: Power supply +18 .. 30 V DC
Terminal 11: Gnd

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Current monitoring

Monitoring flows of currents enables a constant control of individual devices and installation components. Discrepancies or disruptions arising in the electrical circuit can easily be evaluated as breakdowns. Targeted rectifying procedures can be taken.
The **WAVECONTROL** range of products convert sinusoidal/non-sinusoidal AC/DC currents up to 60 A to standard analogue signals. The measurement processes are based on 2 basic principles.
One principle is alternating currents up to 10 A ac and 50/60 Hz are measured using the **transformer process**. The module is looped directly into the measurement circuit.
A **Hall-effect** element comes in to operation at 10 A ac/dc.

The potential-free wire is inserted through the module, allowing currents up to 60 A ac/dc to be measured. Quite often, there are high-frequency parts of signals on the wire to be measured. In order to be able to take these parts of the signals into consideration, so-called **TRMS converters** (**T**RUE **R**oot **M**ean **S**quare) are connected to the Hall sensors. This enables measurements up to 2 kHz, independent of the shape of the curve.
Standard signals (0...20, 4...20 mA, 4...20 A current loop supply, 0...10 V) or a switch output are on offer.

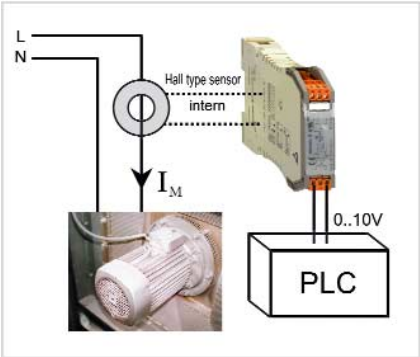
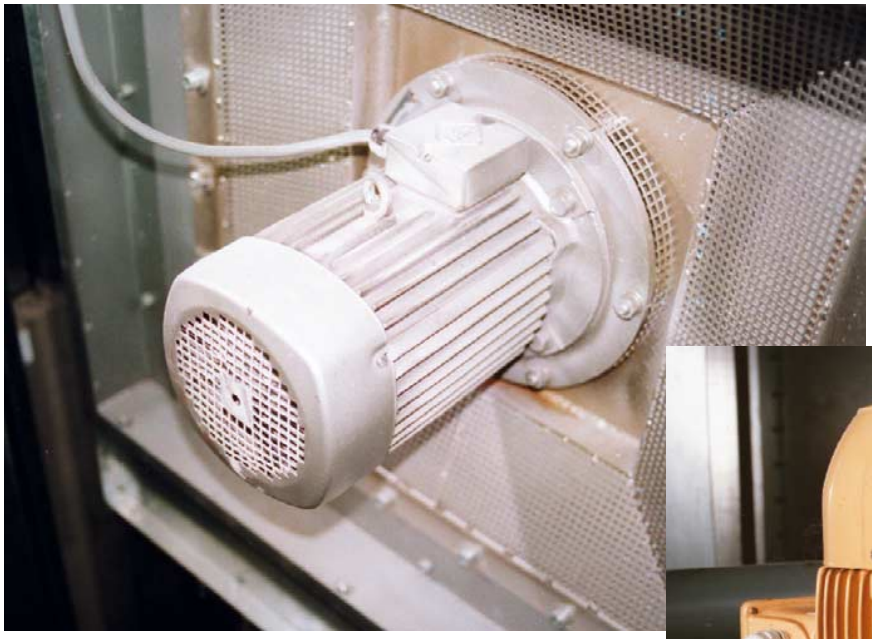


Fig.: Monitoring motor currents



Monitoring a motor in a cooling system

Monitoring a pump in a sewage treatment plant

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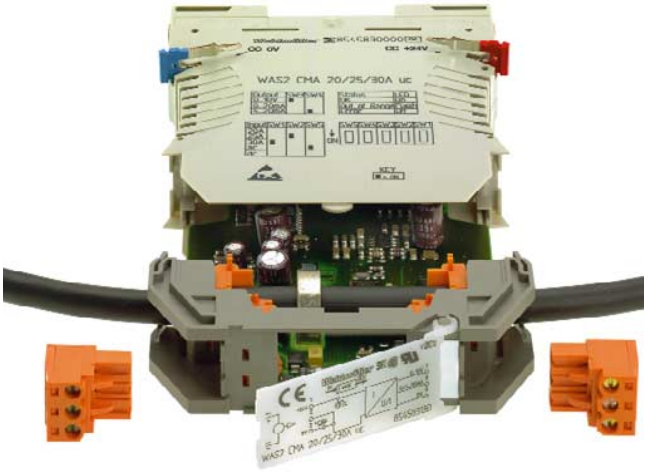

- Galvanically isolated measurement circuit
- Measurements of direct and alternating currents possible
- TRMS versions for measuring non sinusoidal signals
- Measurement range switch without calibration
- Relay version with selectable hysteresis
- Selectable working and closed-circuit current process for defined statuses (optional as normally open or normally closed contact)
- Error indication via LED indication

- Less wiring costs thanks to cross-connections
- Very good marking options
- Fast commissioning – pluggable replacement PCBs
- Connection technology – screw or tension clamp via socket block
- Tool-free mounting
- Coding elements in the connections – false plugging not possible

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Current Monitoring

WAVECONTROL

- **current ranges adjustable via DIP switch**
- **cross-connectable voltage supply via cross-connectors**
- **selectable hysteresis**
- **selectable working and closed-circuit current principle**

Approvals:

CE cULus

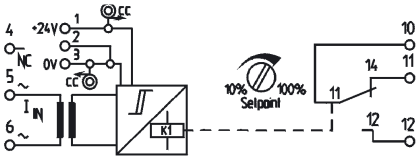
WAS2 CMR
WAZ2 CMR

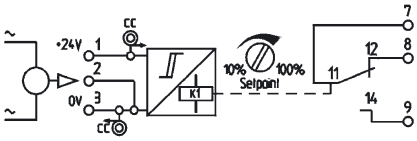
1/5/10 A ac selectable with relay output

WAS2 CMR
WAZ2 CMR

20/40/60A ac selectable with relay output

Block diagram





Ordering data	Type	Cat. No.	Qty.	Type	Cat. No.	Qty.
Screw connection	WAS2 CMR 1/5/10A ac	**8516560000**	1	WAS2 CMR 20/40/60A ac	**8513340000**	1
Tension clamp connection	WAZ2 CMR 1/5/10A ac	**8516570000**	1	WAZ2 CMR 20/40/60A ac	**8526600000**	1

Technical data*		
Input		
Input current	1A ac/5A ac/10A ac selectable (without additional adjustment)	20A ac/40A ac/60A ac selectable (without additional adjustment)
Input frequency	50Hz/60Hz	50Hz/60Hz
Pass through diameter		8mm
Measuring principle	transformer coupled	Contact-free current monitoring using Hall sensor
Connection type	screw or tension clamp connection	Push-through connection
Measurement circuit voltage	250Vac	400Vac, higher voltages dependent on wire insulation
Max. measuring circuit	100A for 1s	dependent on wire cross-section
Output		
Contact set	1 changeover contact	1 changeover contact
Min. switching voltage	6Vdc/6Vac	6Vdc/6Vac
Max. switching voltage	60Vdc/250Vac	60Vdc/250Vac
Continuous current AC	3A	3A
Continuous current DC	0.7A	0.7A
Max. switching current	7A	7A
Min. switching current	100mA	100mA
Status LED	green LED	green LED
Threshold	10% ... 100% adjustable via front potentiometer	10% ... 100% adjustable via front potentiometer
Hysteresis	approx. 5% or approx. 10% selectable from set threshold	approx. 5% or approx. 10% selectable from set threshold
Temperature coefficient	≤ 800 ppm/K	≤ 250 ppm/K
Response time (10 ... 90%)	typ. 700 ms	typ. 700 ms
Working/closed-circuit current principle	selectable	selectable
Coordination of insulation acc. to DIN EN 50178, 04/98		
Rated voltage	300V	300V
Surge voltage	4KV	4KV
Overvoltage category	III	III
Contamination class	2	2
Clearance and creepage distance	≥ 3 mm	≥ 3 mm
Test voltage	4kV eff	4kV eff

General		
Supply		
Supply voltage	21.6Vdc...24Vdc...26.4Vdc	21.6Vdc...24Vdc...26.4Vdc
Power consumption at rated voltage	8.3 mA (relay not switched)	23 mA (relay not switched)
	24 mA (relay switched)	47 mA (relay switched)
Reverse polarity protection	yes	yes
Current carrying capacity of the cross-connection	≤ 2 A	≤ 2 A
Operating temperature range	0 ... 50ºC	0 ... 50ºC
Storage/transport	-20 ... +70ºC	-20 ... +70ºC
Factory setting	Input range: 5A ac; hysteresis 10%, working current principle	Input range :40A ac; hysteresis 10% working current principle
Dimensions L/H/B (mm)	92.4/112.4/22.5	92.4/112.4/22.5
Weight	150g	150g
Approvals	CE, cUL	CE, cUL
Dimensions and accessories see	Page 298 + 308	Page 298 + 308

* T_U = 23 °C single module

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Current Monitoring

WAVECONTROL

- **input and output range adjustable via DIP switch**
- **no calibration required**
- **cross-connectable voltage supply via cross-connectors**

WAS1 CMA
WAZ1 CMA

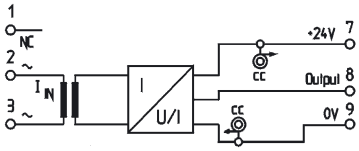
1/5/10A ac selectable with analogue output 0…20 mA / 4…20 mA 0…10 V

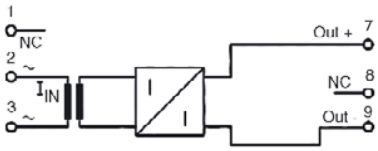
WAS1 LP CMA
WAZ1 LP CMA

1/5/10 A ac selectable with analogue output 4…20 mA loop powered

Approvals:

Block diagram





Ordering data	Type	Cat. No.	Qty.	Type	Cat. No.	Qty.
Screw connection	WAS1 CMA 1/5/10A ac	**8523400000**	1	WAS1 LP CMA 1/5/10A ac	**8528650000**	1
Tension clamp connection	WAZ1 CMA 1/5/10A ac	**8523410000**	1	WAZ1 LP CMA 1/5/10A ac	**8528660000**	1
Technical data*						
Input						
Input current	1 A ac/5 A ac/10 A ac selectable (without additional adjustment)			1A ac/5A ac/10A ac selectable (without additional adjustment)		
Input frequency	50 Hz/60 Hz			50 Hz/60 Hz		
Accuracy	0.5% FSR			0.5% FSR		
Measuring principle	transformer coupled			transformer coupled		
Connection type	Screw or tension clamp connection			Screw or tension clamp connection		
Measurement circuit voltage	250 Vac			250 Vac		
Max. measuring circuit	100 A for 1s			100 A for 1s		
Output						
Current/voltage selectable	0 ... 10 V			4 ... 20mA current loop supply		
	0 ... 20 mA					
	4 ... 20 mA					
Output voltage	0 ... 10 V					
Offset voltage	max. 0.05 V					
Load resistance	≥1 K Ω					
Output signal limit	approx. 13 V and 24 mA			approx. 24 mA		
Output current	0/4 ... 20 mA			4 ... 20 mA		
Offset current	max.100 µA			max. 100 µA		
Load resistance	≤ 600 Ω			≤ 550 Ω (at 24 V) RL = (Vcc - 13V) / 20 mA		
				Dependent on voltage Vcc		
Status LED	green LED			green LED		
	ON–> OK; blinks –> signal out of range; OFF –> Error			ON–> OK; blinks –> signal out of range; OFF –> Error		
Temperature coefficient	≤ 200 ppm/K			≤ 200 ppm/K		
Response time (10 ... 90%)	typ. 700 ms			typ. 700 ms		
Coordination of insulation acc. to DIN EN 50178, 04/98						
(safe separation)						
Rated voltage	300V			300V		
Surge voltage	6KV			6KV		
Overvoltage category	III			III		
Contamination class	2			2		
Clearance and creepage distance	≥ 5.5 mm			≥ 5.5 mm		
Test voltage	4kV eff			4kV eff		
General						
Supply						
Supply voltage	21.6 Vdc...24 Vdc...26.4 Vdc			13 Vdc ... 30 Vdc		
Power consumption at rated voltage	40 mA at I_{out} = 20 mA					
Reverse polarity protection	yes			yes		
Operating temperature range	0 ... 50ºC			0 ... 50ºC		
Storage/transport	- 20 ... + 70ºC			-20 ... +70ºC		
Factory setting	0 ... 5A ac; 4 ... 20mA			0 ... 5A ac; 4 ... 20mA		
Dimensions L/H/W (mm)	72/92.4/22.5			72/92.4/22.5		
Weight	150g			150g		
Approvals	CE, cUL			CE, cUL		
Dimensions and accessories see	Page 298 + 308			Page 298 + 308		

* T_U = 23 °C single module

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WAVEcontrol

- **input and output range adjustable via DIP switch**
- **no calibration required**
- **true TRMS value measurements**
- **hall sensor measurement method**

Approvals:

CE cULus

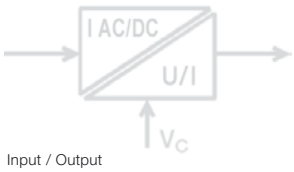
WAS2 CMA
WAZ2 CMA

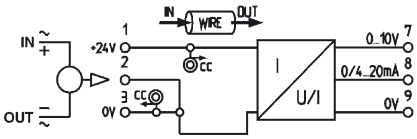
5/10A ac/dc selectable with analogue output
0 ... 20 mA/
4 ... 20 mA/
0 ... 10 V

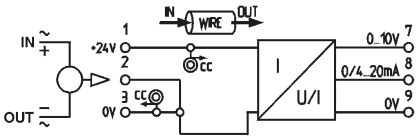
WAS2 CMA
WAZ2 CMA

20/25/30A ac/dc selectable with analogue output
0 ... 20 mA/
4 ... 20 mA/
0 ... 10 V

Block diagram







Input / Output configurable

Ordering data	Type	Cat. No.	Qty.	Type	Cat. No.	Qty.
Screw connection	WAS2 CMA 5/10A uc	**8526610000**	1	WAS2 CMA 20/25/30A uc	**8545830000**	1
Tension clamp connection	WAZ2 CMA 5/10A uc	**8526620000**	1	WAZ2 CMA 20/25/30A uc	**8545840000**	1
Technical data*						
Input						
Input current	5 A uc/10 A uc selectable (without additional adjustment)			20/25/30 A uc selectable (without additional adjustment)		
Input frequency	0 Hz - 2 kHz (True RMS to DC Converter)			0 Hz - 2 kHz (True RMS to DC Converter)		
Accuracy	1% (0 Hz - 1 kHz) Crest factor 3 FSR			1% (0Hz - 1KHz) Crest factor 3 FSR		
	2% (0 Hz - 2 kHz) Crest factor 5 FSR			2% (0Hz - 2KHz) Crest factor 5 FSR		
Measuring principle	Contact-free current monitoring using Hall sensor			Contact-free current monitoring using Hall sensor		
Connection type	Push-through connection			Push-through connection		
Pass through diameter	8 mm			8 mm		
Measurement circuit voltage	400 Vac, higher voltages dependent on wire insulation			400 Vac, higher voltages dependent on wire insulation		
Max. measuring circuit	dependent on wire cross-section			dependent on wire cross-section		
Output						
Current/voltage selectable	0 ... 10 V			0 ... 10 V		
	0 ... 20 mA			0 ... 20 mA		
	4 ... 20 mA			4 ... 20 mA		
Output voltage	0 ... 10 V			0 ... 10 V		
Offset voltage	max. 0.08 V			max. 0.08 V		
Load resistance	≥1 KΩ			≥1 KΩ		
Output signal limit	approx. 13 V and. 24 mA			approx. 13 V and. 24 mA		
Output current	0/4 ... 20 mA			0/4 ... 20 mA		
Offset current	max.150 µA			max.150 µA		
Load resistance	≤ 600 Ω			≤ 600 Ω		
Status LED	green LED			green LED		
	ON–> OK; blinks –> signal out of range; OFF –> Error			ON–> OK; blinks –> signal out of range; OFF –> Error		
Temperature coefficient	≤ 650 ppm/K			≤ 650 ppm/K		
Response time (10 ... 90%)	typ. 700 ms			typ.700 ms		
Coordination of insulation acc. to DIN EN 50178, 04/98						
(safe separation)						
Rated voltage	300 V			300 V		
Surge voltage	6 KV			6 KV		
Overvoltage category	III			III		
Contamination class	2			2		
Clearance and creepage distance	≥ 5.5 mm			≥ 5.5 mm		
Test voltage	4 kV eff			4 kV eff		
General						
Supply						
Supply voltage	21.6 Vdc...24 Vdc...26.4 Vdc			21.6 Vdc...24 Vdc...26.4 Vdc		
Power consumption at rated voltage	50 mA at I_{out} = 20 mA			50 mA at I_{out} = 20 mA		
Reverse polarity protection	yes			yes		
Operating temperature range	0 ... 50 °C			0 ... 50 °C		
Storage/transport	-20 ... +70 °C			-20 ... +70 °C		
Factory setting	0 ... 5A uc; 4 ... 20 mA			0 ... 25 A uc; 4 ... 20mA		
Dimensions L/H/B (mm)	92.4/112.4/22.5			92.4/112.4/22.5		
Weight	150 g			150g		
Approvals	CE, cUL			CE, cUL		
Dimensions and accessories see	Page 298 + 308			Page 298 + 308		

* T_U = 23 °C single module

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WAVECONTROL

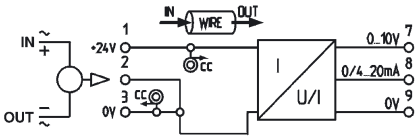
- **input and output range adjustable via DIP switch**
- **no calibration required**
- **cross-connectable voltage supply via cross-connectors**
- **true TRMS value measurements**
- **hall sensor measurement method**

WAS2 CMA
WAZ2 CMA

40/50/60A ac/dc selectable with analogue output
0 ... 20 mA/
4 ... 20 mA/
0 ... 10 V

Approvals:

Block diagram



Ordering data	Type	Cat. No.	Qty.
Screw connection	WAS2 CMA 40/50/60A uc	**8513330000**	1
Tension clamp connection	WAZ2 CMA 40/50/60A uc	**8526590000**	1

Technical data*	
Input	
Input current	40/50/60A uc selectable (without additional adjustment)
Input frequency	0 Hz - 2 kHz (True RMS to DC Converter)
Accuracy	1% (0Hz - 1KHz) Crest factor 3 FSR
	2% (0Hz - 2KHz) Crest factor 5 FSR
Measuring principle	Contact-free current monitoring using Hall sensor
Connection type	Push-through connection
Pass through diameter	8 mm
Measurement circuit voltage	400 Vac, higher voltages dependent on wire insulation
Max. measuring circuit	dependent on wire cross-section
Output	
Current/voltage selectable	0 ... 10 V
	0 ... 20 mA
	4 ... 20 mA
Output voltage	0 ... 10V
Offset voltage	max. 0.08 V
Load resistance	≥ 1 kΩ
Output signal limit	approx. 13 V and. 24 mA
Output current	0/4 ... 20 mA
Offset current	max.150 µA
Load resistance	≤ 600 Ω
Status LED	green LED
	ON–> OK; blinks –> signal out of range; OFF –> Error
Temperature coefficient	≤ 650 ppm/K
Response time (10 ... 90%)	type 700 ms
Coordination of insulation acc. to DIN EN 50178, 04/98	
(safe separation)	
Rated voltage	300 V
Surge voltage	6 KV
Overvoltage category	III
Contamination class	2
Clearance and creepage distance	≥ 5.5 mm
Test voltage	4 kV eff
General	
Supply	
Supply voltage	21.6 Vdc...24 Vdc...26.4 Vdc
Power consumption at rated voltage	50 mA at I_{out} = 20 mA
Reverse polarity protection	yes
Operating temperature range	0 ... 50ºC
Storage/transport	-20 ... +70ºC
Factory setting	0 ... 50 A uc; 4 ... 20 mA
Dimensions L/H/W (mm)	92.4/112.4/22.5
Weight	150 g
Approvals	CE, cUL
Dimensions and accessories see	Page 298 + 308

* T_U = 23 °C single module

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Current Monitoring

- For AC/DC
- With and without adjustable switching threshold
- Opto-coupler output

SMSI DC O

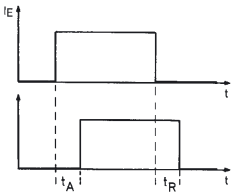
With adjustable switching threshold

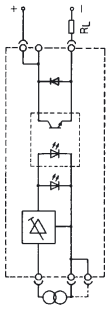
Up to 50 mA **Up to 250 mA**

This series is particularly suitable for monitoring small currents from 50 mA to 5 A.

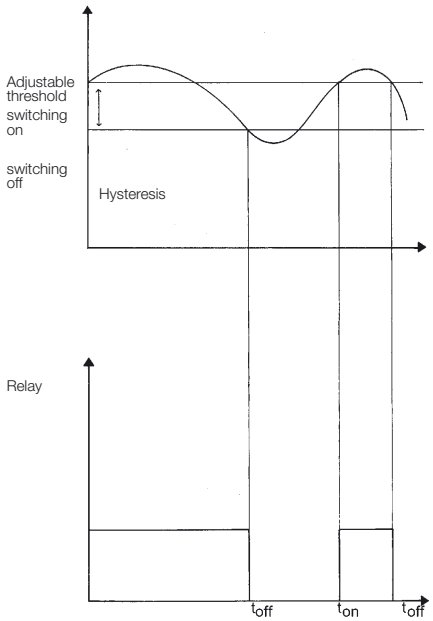
The adjustable switching threshold activates optionally one relay-or opto-coupler output each.

Block diagram/ timing diagram





Ordering data	Type	Cat. No.	Type	Cat. No.
	SMSI 0.05 DC O	**1157160000**	SMSI 0.25 DC O	**1156360000**
Technical data				
Measurement circuit voltage	10 V… 250 Vdc		10 V… 250 Vdc	
Max. permissible current in measurement circuit	**70 mA**		**350 mA**	
Rated consumption – (W)	200 mW		750 mW	
Rated consumption ~ (VA)	–		–	
Adjustable switching threshold	**1 mA…50 mA**		**40 mA…250 mA**	
Hysteresis between turn-on and turn-off point	0.5 % (50 mA)…5 % (1 mA)		2% (250 mA)…10% (40 mA)	
Activation time t_A	< 10 ms		< 3 ms	
Reaction time t_R	< 10 ms		< 3 ms	
Voltage drop at input	< 4 V		< 3 V	
Output voltage	5 V…50 Vdc		5 V…50 V–	
Max. continuous output current	100 mA		100 mA	
Saturation voltage	≤ 1.3 V		≤ 1.3 V	
Auxiliary voltage				
Auxiliary voltage rated consumption				
Auxiliary voltage rated data				
Storage temperature	–25 °C…+60 °C		–25 °C…+60 °C	
Ambient temperature				
–, assembled without spacing on TS	–25 °C…+40 °C		–25 °C…+40 °C	
–, assembled with ≥ 20 mm spacing on TS	–25 °C…+50 °C		–25 °C…+50 °C	
Coordination of insulation according to VDE, Draft 11/94				
Overvoltage category, input			II	
Overvoltage category, output	II		I	
Overvoltage category, input 1-input 2,	I			
Output 1-output 2, input-output	III		III	
Contamination class	2		2	
Dimensions and connection data				
see page 306 + 307	Fig. V		Fig. V	



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SMSI AC O

With adjustable switching threshold

up to 250 mA **Up to 2.5 A**

SMSI AC O

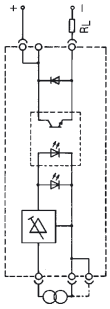
Current monitoring units with transistor output up to 5 A

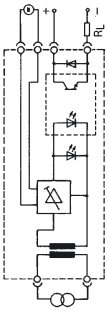
without switching threshold

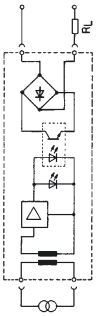
SMSI AC

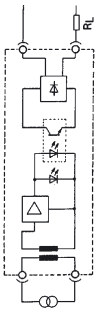
Current monitoring with indicator up to 5 A

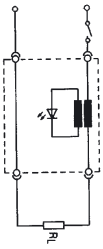
without switching threshold











Type	Cat. No.	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
SMSI 0.25 AC O	**1156460000**	SMSI 2.5 AC O	**1157360000**	SMSI 5 AC O	**1112160000**	SMSI 5 AC O	**8026930000**	SMSI 5 AC	**1112060000**
10 V…250 Vac		10 V…250 Vac		5…250 Vav		5…250 Vac		5…250 Vac	
300 mA		**2.8 A**		**1 A…5 A**		**1 A…5 A**		**1 A…5 A**	
–		–		-		-		-	
1075 mVA		250 mVA		-		-		-	
40 mA…250 mA		**0.2 A…2.2 A**		-		-		-	
≤ 5%		≤ approx. 35%		-		-		-	
≤ 40 ms		≤ 55 ms		≤ 10 ms		≤ 10 ms		-	
≤ 15 ms		≤ 20 ms		≤ 20 ms		≤ 20 ms		-	
< 4.3 V~eff (I = 250 mA)		< 100 mV~eff (I = 10 A)		< 200 mV		< 200 mV		< 200 mV	
5 V…50 V–		5 V…50 V–		24 Vuc ± 10%		5…48 Vdc			
100 mA		100 mA		100 mA		100 mA			
≤ 1.3 V		≤ 1.3 V		< 3.2 V		< 1.6 V			
		24 Vuc ±10%							
		550 mW–/1150 mVA~							
		23 mA–/47 mA~							
–25 °C…+60 °C		–25 °C…+60 °C		–40 °C…+60 °C		–40 °C…+60 °C		–40 °C…+60 °C	
–25 °C…+40 °C		–25 °C…+40 °C		–25 °C…+40 °C		–25 °C…+40 °C		–25 °C…+40 °C	
–25 °C…+50 °C		–25 °C…+50 °C		–25 °C…+50 °C		–25 °C…+50 °C		–25 °C…+50 °C	
II		II		II		II		II	
I		I		I		I		I	
III		III		III		III		III	
2		2		2		2		2	
Fig. V		Fig. V		Fig. II		Fig. II		Fig. II	

Analogue Signal Processing

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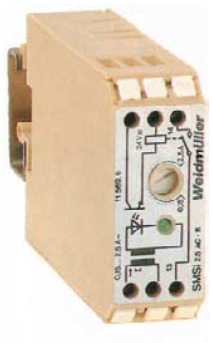
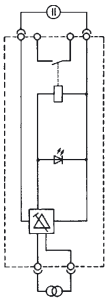
Current Monitoring

- For AC/DC
- Adjustable switching threshold
- Relay output

SMSI DC R

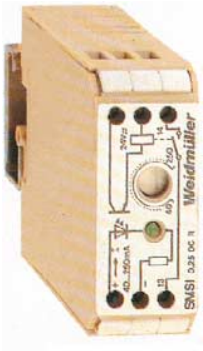
With adjustable switching threshold
up to 250 mA

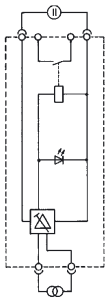




SMSI AC R

With adjustable switching threshold
up to 250 mA





Ordering data	Type	Cat. No.	Type	Cat. No.
	SMSI 0.25 DC R	**1156660000**	SMSI 0.25 AC R	**1159960000**
Technical data				
Measurement circuit voltage	10 V…250 Vdc		10 V…250 Vac	
Max. permissible current in measurement circuit	**350 mA**		**300 mA**	
Rated consumption ~ (VA)	750 mVA (I = 250 mA)		1075 mVA (I = 250 mA)	
Voltage drop at input	≤ 3 V (I = 250 mA)		≤ 3 V (I = 250 mA)	
Adjustable switching threshold	**40 mA…250 mA–**		**40 mA…250 mA~**	
Hysteresis between turn-on and turn-off point	2% (250 mA)<IHY<10% (40 mA)		≤ 5%	
Activation time tA	-		≤ 25 ms	
Reaction time tR	≤ 12 ms		≤ 15 ms	
Recovery	-		-	
Output voltage	250 V		250 V	
Max. continuous output current	3 A		3 A	
Auxiliary voltage	24 V~ ±10%		24 V~ ±10%	
Rated consumption auxiliary voltage	250 mW/450 mVA		250 mW/450 mVA	
Max. switching current	8 A		8 A	
Contact	1 NO[1])		1 NO[1])	
Contact material	AgNi, gold-flashed		AgNi, gold-flashed	
Storage temperature	–25 °C…+60 °C		–25 °C…+60 °C	
Ambient temperature				
–, assembled without spacing on TS	–25 °C…+40 °C		–25 °C…+40 °C	
–, assembled with ≥ 20 mm spacing on TS	–25 °C…+50 °C		–25 °C…+50 °C	
Coordination of insulation to DIN VDE 0160,Draft 11/94				
Overvoltage category, input, output	II		II	
Overvoltage category, input1-input2, Output1-output 2, input-output	III		III	
Contamination class	2		2	
Dimensions and connection data				
see page 307	Fig. V		Fig. V	

[1]) NC on request

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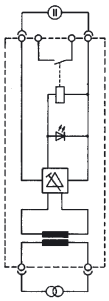
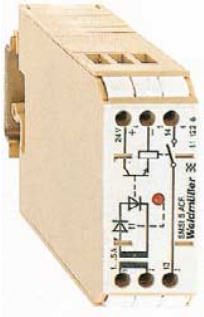
SMSI AC R

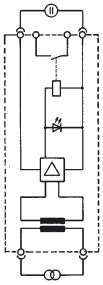
With adjustable switching threshold
up to 2.5 A



SMSI AC R

Current monitoring with relay output up to 5 A
without switching threshold





Ordering data	Type	Cat. No.	Type	Cat. No.
	SMSI 2.5 AC R	**1156960000**	SMSI 5 AC R	**1112260000**

Technical data		
Measurement circuit voltage	10 V…250 Vac	10 V…250 Vac
Max. permissible current in measurement circuit	**3 A**	**1 A…5 A**
Rated consumption ~ (VA)	250 mVA (I = 2.5 A)	1 VA (I = 5 A)
Voltage drop at input	< 0.1 V (I = 2.5 A)	< 1 VA (I = 5 A)
Adjustable switching threshold	**0.2…2.2 A**	-
Hysteresis between turn-on and turn-off point	≤ approx. 5%	-
Activation time tA	≤ 45 ms	-
Reaction time tR	≤ 30 ms	-
Recovery	< 75 ms	-
Output voltage	250 V	250 V
Max. continuous output current	3 A	3 A
Auxiliary voltage	24 Vuc ±10%	24 Vdc ±10%
Rated consumption auxiliary voltage	1000 mW	-
Max. switching current	5 A	8 A
Contact	1 NO[1])	1 NO[1])
Contact material	AgNi, gold-plated 3 µm	AgNi, gold-plated 3 µm
Storage temperature	–40 °C…+60 °C	–40 °C…+60 °C
Ambient temperature		
–, assembled without spacing on TS	–25 °C…+40 °C	–25 °C…+40 °C
–, assembled with ≥ 20 mm spacing on TS	–25 °C…+50 °C	–25 °C…+50 °C
Coordination of insulation to DIN VDE 0160,Draft 11/94		
Overvoltage category, input, output	II	II
Overvoltage category, input1-input2, Output1-output 2, input-output	III	III
Contamination class	2	2
Dimensions and connection data		
see page 307	Fig. V	Fig. V

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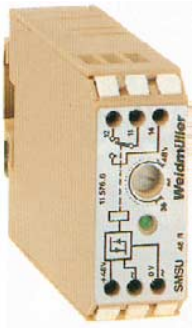
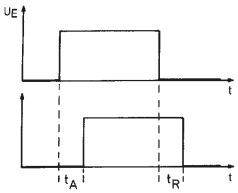
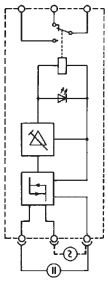
Voltage Monitoring

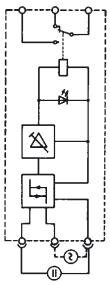
- Voltage monitoring from 18 to 299 V
- One and three phase version
- Adjustable switching threshold

	SMSU 24 R	SMSU 48 R
		

Block diagram/ timing diagram

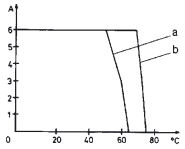


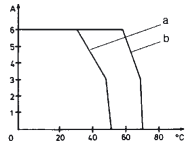




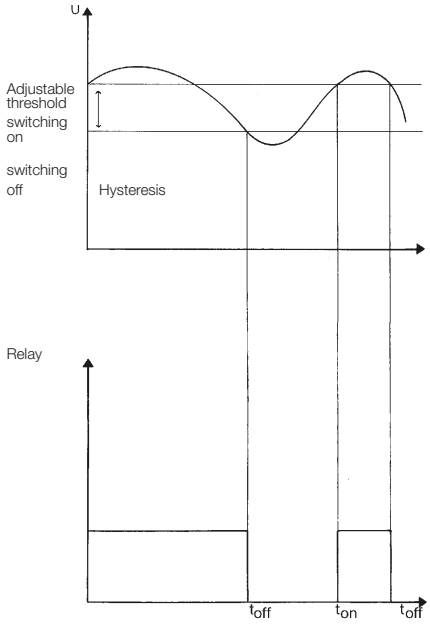
Ordering data	Type	Cat. No.	Type	Cat. No.
	SMSU 24 R	**1156760000**	SMSU 48 R	**1157660000**

Technical data		
Voltage monitoring range	**18 Vdc…27 Vdc or**	**36 Vdc…53 Vdc or**
(also Supply voltage)	**18 Vac…27 Vac/50 Hz**	**36 Vac…53 Vac/50 Hz**
Rated consumption – (W)	< 0.8 W	< 1 W
Rated consumption ~ (VA)	< 0.9 VA	< 1.5 VA
Adjustable switch-off threshold	**18 Vuc…24 Vuc**	**36 Vuc…48 Vuc**
Hysteresis/factory setting	1%…10%/5%	1%…10%/5%
Switching points	–	–
Activation time t_A	< 4 s	< 2.5 s
Reaction time t_R	< 300 ms	< 300 ms
Derating curve		
a = assembled without spacing on mounting rail		
b = assembled with ≥ 20 mm spacing on mounting rail		





Max. output voltage	250 V~	250 V~
Max. switching current	8 A	8 A
Max. continuous output current	3 A	3 A
Contact	1 changeover contact	1 changeover contact
Contact material	AgNi 0.15 gold-flashed	AgNi 0.15 gold-flashed
Switching capacity (resistive load)	2000 VA	2000 VA
Fuse		
Storage temperature	–40 °C…+60 °C	–40 °C…+60 °C
Ambient temperature		
–, assembled without spacing on TS	–25 °C…+50 °C	–25 °C…+50 °C
–, assembled with ≥ 20 mm spacing on TS	–25 °C…+60 °C	–25 °C…+60 °C
Coordination of insulation to DIN VDE 0160,Draft 11/94		
Overvoltage category, input, input 1-input 2, output		
Overvoltage category, input-output, output 1-output 2		
Contamination class		
Dimensions and connection data see page 306		



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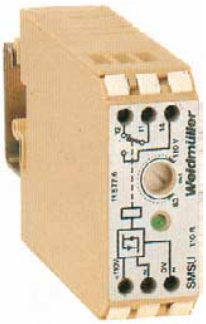
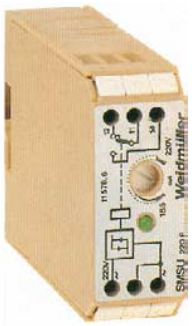
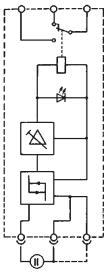
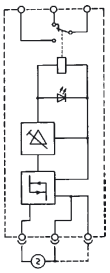
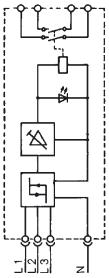
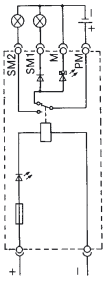
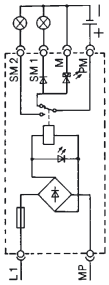
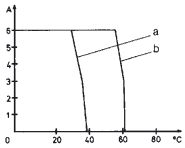
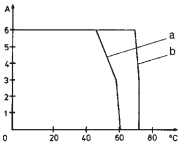
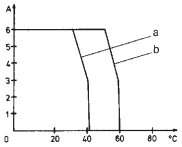
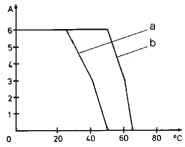
SMSU 110 R	SMSU 220 R	SMSU 260 R	SMSU 3x220 R **Three-phase with** adjustable switching threshold	SMSU 1–24 DC **Single-phase without** switching threshold	SMSU 1–230 AC/DC **Single-phase without** adjustable switching threshold
					
					
Type / Cat. No.	Type / Cat. No.	Type / Cat. No.	Type / Cat. No.	Type / Cat. No.	Type / Cat. No.
SMSU 110 R **1157760000**	SMSU 220 R **1157860000**	SMSU 260 R **1160160000**	SMSU 3x220 R, 2 NO **1156560000** 3x220 R, 1 NC./1 NO **1178760000**	SMSU 24 DC **0555060000**	SMSU 230 AC/DC **0555160000**
83 Vdc…121 Vdc or 83 Vac…121 Vac/50 Hz	**165 Vac…253 Vac/50 Hz**	**200 V…299 Vac/50 Hz**	**165 V~…230 Vac 50 Hz**	**24 Vdc ± 10%**	**230 Vdc ±10%**
< 1.6 W	–	–		**0.5 W**	**0.9 W**
< 1.5 W	< 10 VA	< 10 VA	9 VA (L3); 60 mVA (L 1/L 2)	–	1.1 W
83 Vuc…110 Vuc	**165 Vac…220 V**ac	**200 V…260 V**	150 V~…205 V~	–	–
1%…10%/5%	1%…15%/5%	1%…15%/5%	–/7%	–	–
–	–	–	–	–	–
< 4 s	< 3 s	< 3 s	< 4 s	On: 18.5 V, off: 5 V	On: 140 V–/130 V–, off: 70 V–/80 V~
< 300 ms	< 2 s	< 2 s	< 80 ms	15 ms	–
				10 ms	–
					
250 V~	250 V~	250 V~	250 V~	24 V– ± 10%	24 V– ± 10%
8 A	8 A	8 A	8 A		
3 A	3 A	3 A	3 A	1 A	1 A
1 changeover contact	1 changeover contact	1 changeover contact	2 NO (115656) 1 NO/1 NC (117876)	1 changeover contact	1 changeover contact
AgNi 0.15 gold-flashed	AgNi 0.15 gold-flashed	AgNi 0.15 gold-flashed	AgCdO, gold-flashed	AgNi, gold-flashed	AgNi, gold-flashed
2000 VA	2000 VA	2000 VA	$5x10^7$ switching operations	10^6 switching operations	10^6 switching operations
			$2x10^5$ switching operations	100 mA	100 mA
			10^5 switching operations		
–40 °C…+60 °C	–40 °C…+60 °C	–40 °C…+60 °C	–40 °C…+60 °C	–40 °C…+60 °C	–40 °C…+60 °C
–25 °C…+30 °C	–25 °C…+45 °C	–25 °C…+45 °C	–5 °C…+40 °C	–25 °C…+40 °C	–25 °C…+40 °C
–25 °C…+55 °C	–25 °C…+60 °C	–25 °C…+60 °C	–5 °C…+55 °C	–25 °C…+50 °C	–25 °C…+50 °C
			II		
			III		
			2		

Analogue Signal Processing

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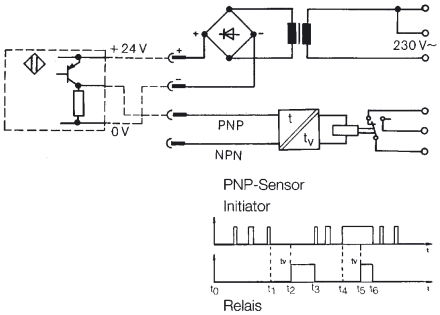
SMS
SIZA

Rotational speed monitoring

Block diagram



Ordering data

Type	Cat. No.
SMS/SIZA	**1110560000**

Description

Power supply with delayed turn-off relay output for three-conducutor DC initiators (NPN or PNP).
The transformer supplies the initiator with 24 V DC. The initiator signal activates the relay, at which time the adjustable turn-off delay becomes effective. This module is particularly suitable for monitoring cyclic movements, e.g, down-times monitoring of conveyor drives, ventilators and pumps or stroke monitoring of valves, die cutters and drilling heads.
A contact element actuates the initiator at regular intervals. If these pulses cease, i.e. the proximity switch is continuously actuated (t_4-t_6) or deactivated (t_1-t_3), the relay transmits a signal after the set time has elapsed. During normal operation, the time function bridges the gaps between regular pulses (t_0-t_2)

Technical data

Operating voltage	230 Vdc +5 –15%
Initiator type/initiator voltage	P or N switched/24 Vdc
Output voltage	250 V
Continuous current	4 A
Max. switching capacity (resistive load)	2000 VA
Contact	1 changeover contact
Contact material	AgNi 0.15 gold-flashed
Mechanical service life	> 10^7 switching operations
Time range	0.5…5 s

Coordination of insulation to VDE DIN 0160, draft11/94

Rated voltage	300 V
Rated surge voltage	4 kV
Overvoltage category	III
Contamination class	2
Clearance and creepage distance	≥ 3 mm
EMC	EN 50 081-1/50 082-2

Accessories and dimensions see page 307 Fig. VI

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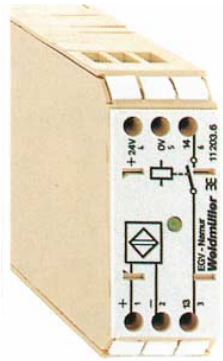
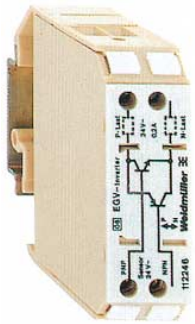
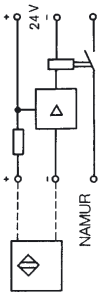
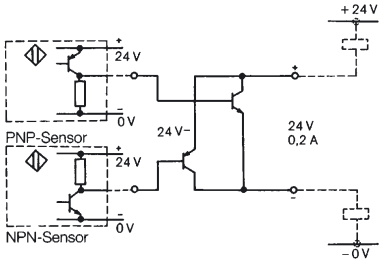
Namur Switch Amplifiers

	EGV-Namur	EGV-Inverter
		
Block diagram		

Ordering data

Type	Cat. No.	Type	Cat. No.
EGV Namur	**1120360000**	EGV Inverter	**1122460000**

Description

Switching amplifier for 2-wire Namur initiators with relay output.

Enables the use of economic Namur initiators with short design lengths. This is particularly valid for areas where initiators are subjected to heavy mechanical stresses, and often need to be replaced. A potential-free NO contact is available on the output side for switching larger ratings (2000 VA). The Namur initiator can be directly connected to the module.
LED function indicators indicate switching statuses.

This module inverts the switching function of electronic outputs.

A PNP output is changed into an NPN output with the load connected unilaterally against the positive potential (the negative potential is switched through). An NPN output is changed into a PNP output with the load connected unilaterally to the frame potential (the positive potential is switched through).
The module reduces the inventory of sensors and electronic switches with PNP/NPN outputs to a single type.

Technical data		
Input voltage	24 Vdc ±10%	24 Vdc ± 10% (closed circuit current < 10 mA)
Initiator type/initiator voltage	approx. 8 Vdc	24 Vdc ± 10% (switching threshold approx. 15 V)
Output voltage, -current	250 Vac/dc	
Continuous current	3 A	200 mA
Max. switching capacity (resistive load)	2000 VA	
Contact	1 NO	
Contact material	AgNi 0.15 gold-flashed	
Mechanical service life	> 10^7 switching operations	
Ambient temperature	40 °C mounted	
Coordination of insulation to VDE DIN 0160, draft11/94		
Rated voltage	300 V	
Rated surge voltage	4 kV	
Overvoltage category	III	
Contamination class	2	
Clearance and creepage distance	≥ 3 mm	
EMC	EN 50 081, EN 50 082, EN50 011	EN 50 081, EN 50 082, EN50 011
Accessories and dimensions see page 307	Fig. VI	Fig. V

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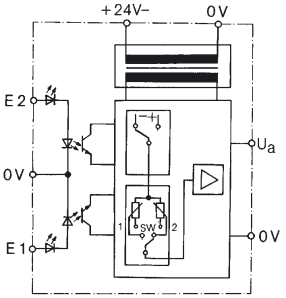
Set Point Generator

EMA/SW 24

- Set point generator
- switchable –10.5 V/+10.5 V

Set point 1 or set point 2 can be switched to the module's output as required.
The changeover is performed safely separated via the control input E1. The output voltage values (0…10.5 V) can be set using the spindle operated potentiometers SW1 and SW2. The control input E" determines the polarity safely separated
(–10.5 V … 0 V … +10 V).
Control input E1: 0 V = set point 1,
24 V = set point 2,
Control input E2: 0 V = positive set point,
24 V = negative set point



electronic changeover switch

Ordering data	Type	Cat. No.
	EMA/SW	**1172660000**

Technical data	
Input signal/measurement range	**0=0 V, 1=+24 V**
Control voltage	24 V±20 %
Max. input current	≤ 7 mA at 24 V
Display	each control input: red LED
Setting	via trimming potentiometer
	25 rotations nom.
Output signal	**adjustable from –10.5 V…+10.5 V**
Output	Voltage output selection by E1/E2
Output current	max. ±25 mA at Urated=24 V–
Load resistance	min. 400 Ω at Urated=24 V
Slew-Rate	0.168 V/µs
Supply voltage UB	24 V– ± 20 %, 30 mA ($R_L = \infty$)
Residual ripple	30 mV/106 kHz (at U_{max})
Reaction time	rising 50 µs
	decreasing 80 µs
Isolation voltage, voltage strength	
Input/output/supply	1 kV-
Input-Output/TS	4 kV_{eff}
Storage temperature	–20 °C…+70 °C
Operating temperature	0 °C…+50 °C
Insulation coordination according to EN 50 178	
Overvoltage category	III
Contamination class	2
Accessories, dimensions and connection data see page 307	Fig. V

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8-Bit Analogue/Digital Converters

Hold function (H):

The converter can, for example, by means of the hold function (H) be matched to the cycle time of a PLC. Holding and release of the conversion. The Hold input (H) is internally connected to 0 V via a resistor.
In order to store the last signal, the Hold input (H) must be supplied with 24 V.

Enable function (E):

The Enable circuit (E) allows several converters, e.g. on an input card of a PLC, to be switched on. The Enable input (E) is connected internally to 0 V via a resistor. In order to make the connection to the PLC, one converter must be disconnected. The other converters are supplied with 24 V (at least 12 V).
This causes the converters at the output to be highly resistive.

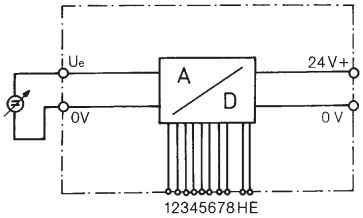
RS/U-D8

RS/I-D 8

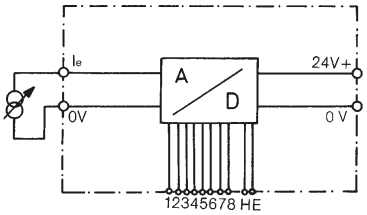
Functions table (example)

Terminal PIN MSB E8	E7	E6	E5	E4	E3	E2	LSB E1	Digital value/ digital value / Analog voltage / Analogue voltage
0	0	0	0	0	0	0	0	**0 V**
0	0	0	0	0	0	0	1	
0	0	0	0	0	0	1	0	
0	0	0	0	0	0	1	1	
-	-					-	-	
-	-					-	-	
1	1	1	1	1	1	0	1	
1	1	1	1	1	1	1	0	
1	1	1	1	1	1	1	1	**+10 V**

Block diagram



Block diagram



Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
	RS/U-D 8	**1122361001**	RS/U-D 8	**1160361001**	RS/I-D 8	**1160561001**	RS/I-D 8	**1168561001**
Technical data								
Input signal	**–10 V…+10 V**		**0…10 V**		**0…20 mA**		**4…20 mA**	
Max. input voltage					3.5 V		3.5 V	
Max. input current	≤ 55 µA		≤ 25 µA		25 mA		25 mA	
Input resistance	≥ 200 kΩ		≥ 400 kΩ		≥ 51 Ω		≥ 51 Ω	
Max. limit frequency	5 kHz at Full-Scale (Sinus)[1]		5 kHz at Full-Scale (Sinus)1)		5 kHz at Full-Scale (Sinus)[1]		5 kHz at Full-Scale (Sinus)[1]	
Resolution	78 mV c 1 LSB		39 mV c 1 LSB		78 µA c 1 LSB		62.5 µA c 1 LSB	
Output signal	**8 Bit** (1 Bit prefix)		**8 Bit**		**8 Bit**		**8 Bit**	
Output current	≤ 25 mA (as source)		≤ 25 mA (as source)		≤ 25 mA (as source)		≤ 25 mA (as source)	
Output level	approx. 17 V c H, 0 V c L		approx. 17 V c H, 0 V c L		approx. 17 V c H, 0 V c L		approx. 17 V c H, 0 V c L	
Prefix	MSB: H c positive, L c negative							
Transmission error	±1 LSB		±1 LSB		±1 LSB		±1 LSB	
Conversion time	≤ 4 µs		≤ 4 µs		≤ 4 µs		≤ 4 µs	
Supply	24 V–, ±20 %, 35 mA		24 V–, ±20 %, 35 mA		24 V–, ±20 %, 35 mA		24 V–, ±20 %, 35 mA	
	(plus output current)		(plus output current)		(plus output current)		(plus output current)	
Connection arrangement								
	Terminal 1	LSB	Terminal 1	LSB	Terminal 1	LSB	Terminal 1	LSB
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Terminal 8	MSB	Terminal 8	MSB	Terminal 8	MSB	Terminal 8	MSB
	Terminal 9	Enable[2]	Terminal 9	Enable[2]	Terminal 9	Enable[2]	Terminal 9	Enable[2]
	Terminal 10	Hold	Terminal 10	Hold	Terminal 10	Hold	Terminal 10	Hold
	Hold function:		Hold function:		Hold function:		Hold function:	
	High c +24 V c storage of last converted value		High c +24 V c storage of last converted value		High c +24 V c storage of last converted value		High c +24 V c storage of last converted value	
	Low c 0 V c free conversion		Low c 0 V c free conversion		Low c 0 V c free conversion		Low c 0 V c free conversion	
Storage temperature	–40 °C…+85 °C		–40 °C…+85 °C		–40 °C…+85 °C		–40 °C…+85 °C	
Operating temperature	0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C	
EMC EN 50 081-1/50 082-2								

[1] 1 LSB-Accuracy

[2] Enable: 24 V = tristate
0 V = free conversion

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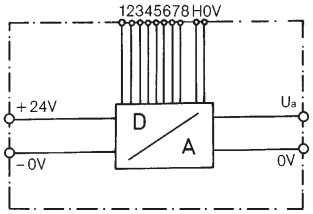
8-Bit Digital/Analogue Converters

RS/D 8-U

RS/D 8-I

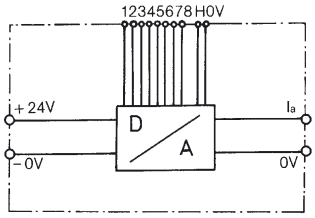
Block diagram

Pin assignment



Block diagram

Pin assignment



Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
	RS/D 8-U	**1123361001**	RS/D 8-U	**1160761001**	RS/D 8-I	**1165861001**	RS/D 8-I	**1169261001**
Technical data								
Input signal	**8 Bit (1 Bit prefix)**		**8 Bit**		**8 Bit**		**8 Bit**	
Max. input voltage	5…24 V (typ. 24 V)		5…24 V (typ. 24 V)		5…24 V (typ., max. 30 V) c H		5…24 V (type., max. 30 V) c H	
Max. input current	2.5 mA		2.5 mA					
Input resistance	50 kΩ per input		50 kΩ per input		50 kΩ per input		50 kΩ per input	
Prefix	MSB: H c positive, L c negative							
Resolution	78 mV c 1 LSB		39 mV c 1 LSB		78 µA c 1 LSB		62.5 µA c 1 LSB	
Output signal	**–10 V…+10 V**		**0…10 V**		**0…20 mA**		**4…20 mA**	
Output current	≤ 10 mA max. current		≤ 10 mA		0…20 mA (as source)		4…20 mA (as source)	
Offset	≤ 20 mV		≤ 20 mV		max. 0.08 mA		4 mA	
Load resistance	≥ 1 kΩ		≥ 1 kΩ		≤ 500 Ω		≤ 500 Ω	
Transmission error	±1 LSB		±1 LSB		±1 LSB		±1 LSB	
Conversion time	≤ 30 µs		≤ 30 µs		≤ 30 µs		≤ 30 µs	
Supply	24 V–, ±20 %, 25 mA		24 V–, ±20 %, 25 mA		24 V–, ±20 %, 25 mA		24 V–, ±20 %, 25 mA	
	(plus output current)		(plus output current)		(plus output current)		(plus output current)	
Connection arrangement								
	Terminal 1	LSB	Terminal 1	LSB	Terminal 1	LSB	Terminal 1	LSB
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Terminal 8	MSB	Terminal 8	MSB	Terminal 8	MSB	Terminal 8	MSB
	Terminal 9	Hold	Terminal 9	Hold	Terminal 9	Hold	Terminal 9	Hold
	Terminal 10	0 V	Terminal 10	0 V	Terminal 10	0 V	Terminal 10	0 V
	Hold function:		Hold function:		Hold function:		Hold function:	
	High c +24 V c storage of last converted value		High c +24 V c storage of last converted value		High c +24 V c storage of last converted value		High c +24 V c storage of last converted value	
	Low c 0 V c free conversion		Low c 0 V c free conversion		Low c 0 V c free conversion		Low c 0 V c free conversion	
Storage temperature	–40 °C…+85 °C		–40 °C…+85 °C		–40 °C…+85 °C		–40 °C…+85 °C	
Operating temperature	0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C	
EMC EN 50 081-1/50 082-2								

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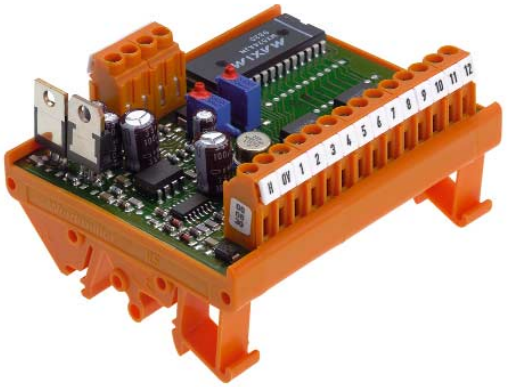
12-Bit Analogue/Digital Converters

Hold function (H):

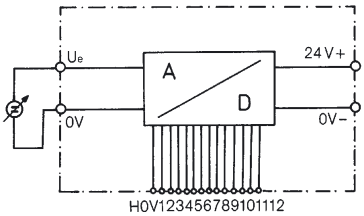
The converter can, for example, by means of the hold function (H) be matched to the cycle time of a PLC. Holding and release of the conversion. The Hold input (H) is internally connected to 0 V via a resistor.
In order to store the last signal, the hold input (H) must be supplied with 24 V.



Functions table (example)

Analog current / Analog current \ Digital volue/ digital value	Terminal PIN MSB 12	11	10	9	8	7	6	5	4	3	2	LSB 1
4 mA	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	1	1
	-	-									-	-
	-	-									-	-
	1	1	1	1	1	1	1	1	1	1	0	1
	1	1	1	1	1	1	1	1	1	1	1	0
20 mA	1	1	1	1	1	1	1	1	1	1	1	1

Block diagram



Block diagram

Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
	RS/U-D 12	**1168261001**	RS/U-D 12	**1168361001**	RS/I-D 12	**1168461001**	RS/I-D 12	**1169161001**
Technical data								
Input signal/measurement range	**–10…+10 V**		**0…10 V**		**0…20 mA**		**4…20 mA**	
Max. input voltage	±15 V		15 V					
Max. input current					30 mA		30 mA	
Input resistance	100 kΩ		100 kΩ		500 Ω		500 Ω	
Prefix	MSB: H c positive, L c negative							
Resolution	4.88 mV c 1 LSB		2.44 mV c 1 LSB		4.9 µA c 1 LSB		4 µA c 1 LSB	
Output signal	**12 Bit** (1 Bit prefix)		**12 Bit**		**12 Bit**		**12 Bit**	
Output current	≤ 25 mA (as source)		≤ 25 mA (as source)		≤ 25 mA (as source)		≤ 25 mA (as source)	
Output level	24 V c H, 0 V c L		24 V c H, 0 V c L		24 V c H, 0 V c L		24 V c H, 0 V c L	
Load resistance								
Transmission error	±1 LSB		±1 LSB		±1 LSB		±1 LSB	
Conversion time	≤ 50 µs		≤ 50 µs		≤ 50 µs		≤ 50 µs	
Temperature coefficient	1 LSB *		1 LSB *		1 LSB *		1 LSB *	
Supply	24 V–, ±20 %		24 V–, ±20 %		24 V–, ±20 %		24 V–, ±20 %	
Max. power loss	4 W		4 W		4 W		4 W	
Connection arrangement	Terminal 1 LSB		Terminal 1 LSB		Terminal 1 LSB		Terminal 1 LSB	
	⋮ ⋮		⋮ ⋮		⋮ ⋮		⋮ ⋮	
	Terminal 12 MSB		Terminal 12 MSB		Terminal 12 MSB		Terminal 12 MSB	
	Hold function:		Hold function:		Hold function:		Hold function:	
	High c +24 V c storage of digital signal		High c +24 V c storage of digital signal		High c +24 V c storage of digital signal		High c +24 V c storage of digital signal	
	Low c 0 V c enabling the conversion cycle		Low c 0 V c enabling the conversion cycle		Low c 0 V c enabling the conversion cycle		Low c 0 V c enabling the conversion cycle	
Storage temperature	–40 °C…+80 °C		–40 °C…+80 °C		–40 °C…+80 °C		–40 °C…+80 °C	
Operating temperature	0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C	
EMC EN 50 081-1/50 082-2								

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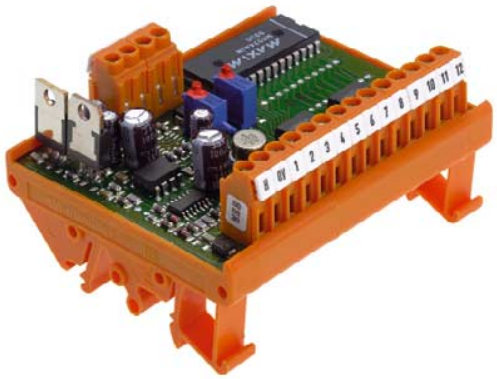
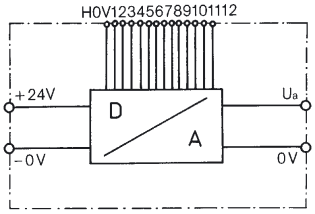
12-Bit Digital/Analogue Converters



Block diagram

Block diagram



Ordering data	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.	Type	Cat. No.
	RS/D 12-U	**1160861001**	RS/D 12-U	**1166161001**	RS/D 12-I	**1166061001**	RS/D 12-I	**1165961001**
Technical data								
Input signal/measurement range	**12 Bit** (1 Bit as prefix)		**12 Bit**		**12 Bit**		**12 Bit**	
Max. input voltage	24 V–, ±20 %		24 V–, ±20 %		24 V–, ±20 %		24 V–, ±20 %	
Input current, I_{nom}	4.2 mA		4.2 mA		4.2 mA		4.2 mA	
Input resistance	5.7 kΩ		5.7 kΩ		5.7 kΩ		5.7 kΩ	
Prefix	MSB: H c positive, L c negative							
Resolution	4.88 mV c 1 LSB		2.44 mV c 1 LSB		4.9 µA c 1 LSB		4 µA c 1 LSB	
Output signal	**–10 V…+10 V**		**0 V…10 V**		**0…20 mA**		**4…20 mA**	
Output current	≤ 10 mA		≤ 10 mA		0…20 mA (as source)		4…20 mA (as source)	
Output level								
Load resistance	≥ 1 kΩ		≥ 1 kΩ		≤ 500 Ω		≤ 500 Ω	
Transmission error	±1 LSB		±1 LSB		±1 LSB		±1 LSB	
Conversion time	≤ 4 µs		≤ 4 µs		≤ 4 µs		≤ 4 µs	
Temperature coefficient	±100 ppm from FSR/°C		±100 ppm from FSR/°C		±100 ppm from FSR/°C		±100 ppm from FSR/°C	
Supply	24 V–, ±20 %, 40 mA		24 V–, ±20 %, 40 mA		24 V–, ±20 %, 60 mA		24 V–, ±20 %, 60 mA	
Max. power loss								
Connection arrangement	Terminal 1 LSB ⋮ ⋮ Terminal 12 MSB Hold function: High c +24 V c storage of analogue signal Low c 0 V c enabling the conversion cycle		Terminal 1 LSB ⋮ ⋮ Terminal 12 MSB Hold function: High c +24 V c storage of analogue signal Low c 0 V c enabling the conversion cycle		Terminal 1 LSB ⋮ ⋮ Terminal 12 MSB Hold function: High c +24 V c storage of analogue signal Low c 0 V c enabling the conversion cycle		Terminal 1 LSB ⋮ ⋮ Terminal 12 MSB Hold function: High c +24 V c storage of analogue signal Low c 0 V c enabling the conversion cycle	
Storage temperature	–40 °C…+85 °C		–40 °C…+85 °C		–40 °C…+85 °C		–40 °C…+85 °C	
Operating temperature	0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C		0 °C…+50 °C	
EMC EN 50 081-1/50 082-2								

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