MRS ELECTRONIC DATASHEET CC16WP 1.154





mounting direction

DESCRIPTION

The CC16WP belongs to our 32-bit CAN I/O generation. 8 current-controlled PWM outputs and 6 multifunction inputs enable, among other things, a switchable pull-up resistor (1 k Ω) and a switchable current sink (330 Ohm). The compact CAN controller has 1 CAN interface, optionally also CAN FD capable. The 2nd interface can be used as LIN, 2nd CAN or RS232 interface.

TECHNICAL DATA

TECHNICAL DATA (CONTINUED)

view of plug

Housing	Waterproof, sealed plastic	Overvoltage protecti	on	≥ 33 V		
	housing			25 μA at 12 V and 24 V		
Connector	Delphi / Aptiv - 211PC249S0033	Reverse polarity pro	tection	yes		
Weight Temperature range acc. to ISO 16750-4	173 g -40 °C85 °C	CAN interface		ISO 11898-2 capable CAN bus transceiver, CAN-FD capable, see assembly variants		
Environmental protection	IP6K8 in the correct installation	LIN interface / RS23	2	Depending on assembly options		
acc. to ISO 20653	position (plug down) and when using the protection cap and cor- rugated tube acc. to the accesso- ries list	REGULATORY APPROVALS AND TESTIN				
	CAUTION! Follow the mechani-	E1 approval	10 R - 0	6 8747		
Current consumption	26 mA at 24 V 45 mA at 12 V	Electrical tests	Acc. to ISO 16750-2 or -4: Short circuit protection (without: RS232 interface)			
Over-current protection	1 A + Load		Reverse	verse polarity		
Total Inputs and outputs	15 (7 analog inputs; 8 I/O's [PWM capable, integrated current measurement INA]; depending on assembly options 2nd CAN bus, LIN bus or 2 additional digital inputs)		Overvoltage at T_{max} -20 °C Storage Test at T_{max} and T_{min} Operation Test at T_{max} and T_{min} Starting profile (form. pulse 4 acc. to IS 7637) Load Dump Test B at 24 V (R ₁ =4 Ω)			
Inputs	Configurable as: Analog input 016 V, switchable to 032 V Digital input Frequency input Current input (330 Ω against GND) 1 k0 pull up against V/		Acc. to 1 3b Acc. to 1 Bulk curr Ed. 2008 Free field 100 V/M	SO 7637 - 2: pulse 1, 2a, 2b, 3a, SO 10605: ESD up to ± 15 kV rent injection acc. to 11452-4: 3. 5 + Corr. 1 2009 up to 100 mA d (ISO 11452-2:2 ed. 2004) up ro		
Outputs	Configurable as: Digital, positive switching PWM output	SOFTWARE/PROGRAMMING		AMMING		
Supply voltage	932 V only if sensor supply is	Programming System				
	(Code B at 12 V, Code E at 24 V, Code F at variant 1.154.211.00, acc. to ISO 16750-2); otherwise 12.232 V (Code F, acc. to ISO 16750-2)	MRS APPLICS STUDIO The Applics Studio is the new development and tool platform for our assemblies. Program your MRS controls quickly and easily with our stand-alone software. The focus is on your application.				



INPUT FEATURES - SUMMARY

Pin A3, A4, A5, A6, B6, C4	Programmable as analog or digital input Resolution	12 Bit	Pin B1, B8, C1, C2, C3, C6, C7, C8	Programmable as analog or digital input Resolution	12 Bit			
Voltage input 016 V (see <u>A</u>) ¹	Input resistance Input frequency Accuracy Conversion factor	40 kΩ f ² = 170 Hz ≤ 3 % 4.16 mV ≈ 1 digit	Voltage input $032 \text{ V} (\text{see } \underline{F})^1$	Input resistance Input frequency Accuracy	30 kΩ f ²= 280 Hz ≤ 3 %			
Voltage input 032 V (see <u>B</u>)	Input resistance Input frequency Accuracy Conversion factor	36 kΩ f ² _g = 340 Hz ≤ 3 % 8.08 mV ≈ 1 digit	Pin B3	Programmable as analog or digital input Resolution	12 Bit			
Frequency input $(see \underline{D})^3$	Input resistance Turn-on threshold Turn-off threshold	40 kΩ 3.7 ± 0.3 V 2.0 ± 0.3 V	Voltage input 016 V (see <u>A</u>) ¹	Input resistance Input frequency Accuracy	34 kΩ f g²= 160 Hz ≤ 3 %			
	Num-on threshold $2.0 \pm 0.3 \text{ V}$ Min. pulsewidth $50 \mu \text{s}$ Meas. range PWM $5-95 \%$ Accuracy $\geq 8 \text{ Hz and } \leq 10 \text{ kHz max. } \pm 3 \%$		¹ standard configuration ² Cutoff frequency (-3 dB), measured with 0-10 V _{Peak} ³ when standard configuration is used					
Current input 024.5 mA (see <u>C</u>)	Input resistance Conversion factor	330 Ω against GND 78.7 digits/mA						
Sensor input (see <u>E</u>)	Input resistance	1 kΩ against A7 (sensor supply)						
Pin A2, B2 (depending on assembly options)	Programmable as digital input Resolution	12 Bit						
Digital input Positive (see <u>G</u>)	Input resistance Turn-on threshold Turn-off threshold Min. pulse width	22.7 kΩ 6 V 4.8 V ≥ 20 ms measu- red at 500 kbaud						
Pin B5 (KL15)	Programmable as digital input Resolution	12 Bit						
Digital input Positive	Input resistance Turn-on threshold Turn-off threshold	22.1 kΩ 5.8 V 4.6 V						



OUTPUT FEATURES - SUMMARY

Pin B1, B8, C1, C2, C3, C6, C7, C8	Protective circuit for inductive loads	Integrated	PWM channels						
	Wire fault diagnostics	Possible via current sense	Frequency 0 (Timer Channel 0)						
	Short circuit diagnostics	Possible via current sense							
Digital, positive switching (high side; see <u>F</u>) including INA current sense	Switching voltage Switching current Accuracy INA293 current sense(for mea- suring ≤100 mA use the calibrated current value with function: calibr_get_value())	9-32 V DC see table 1 Digit \approx 1 mA for 100 mA \geq 3% \geq 1 A	OUT7 (Pin C6 Frequency 1 (Timer Channel 1) OUT6 (Pin C7) Frequency 2 (Timer Channel 2)						
PWM output (see <u>F</u>)	Output frequency Resolution Switching current	10 Hz - 1 kHz 1 ‰ see table	OUT0 (Pin C3) OUT4 (Pin B8) OUT5 (Pin C8)						
Short circuit protection against GND and U _B	Internal overtemperatur latch-off can be realized application	e protection, I by software	Duty Cycle selectable different per output						
Overload protec- tion	Internal overtemperatur latch-off can be realized	e protection, I by software							

PERFORMANCE TEST $\mathsf{T_{_{+85}\,^{\circ}C}}$ HSD-OUTPUTS

application

Test without PWM	Test No.	Load	Duration	Test with PWM	Test No.	PWM / DC	Load	Duration
	1	2.5 A / output (∑ 20 A)	Permanent		1	100 Hz 50 %	2.5 A / output (∑ 20 A)	Permanent
	2	3 A / Output (∑ 24 A)	max. 4 h		2	200 Hz 50 %	2.5 A / output (∑ 20 A)	Permanent
					3	300 Hz 90 %	2.5 A / output (∑ 20 A)	Permanent
					4	400 Hz 50 %	2.5 A / output (∑ 20 A)	Permanent
					5	1 kHz 50 %	2.5 A / output (∑ 20 A)	max. 5 Min





PIN ASSIGNMENT POWER SUPPLY AND INTERFACES

Pin	Description	Pin	Description
A1	Supply voltage for outputs B1, C1-C3, processor ⁴	B2	CAN1-L oder digital input (depending on assembly
A2	LIN master / CAN1-H or digital input (depending on		options)
	assembly options)	B3	ID pin or analog input (acc. to p.2)
A7	Sensor supply, switchable to 5 V (DO_VREF_EN), 8.5 V (DCDC_8V5) or 10 V (DCDC_10V), 500 mA max		CAN0-H
			Contact 15 / ignition
<u>۸</u> ۵	Supply voltage for outputs B8_C6_C8_processor ⁴		
70	Supply voltage for outputs Bo, Co-Co, processor		Ground
			CAN0-L

PIN ASSIGNMENT INPUTS AND OUTPUTS

Pin	Signal	Description	Pin	Signal	Description		
A2	DI_INTERFACES_A	Digital input (depending on assembly options)		AI_OUT4 PWM_HSD2_OUT4	Analog input 4 or PWM output ⁵ 4 or District output 4		
A3	AI_A_IN5 FREQ_A_IN5	Analog input 5 0-16 V or frequency input 5		AI_INA_OUT4	Digital output 4 and INA current sense		
	DO_RS5 PU_A_IN5 PD_A_IN5	Input configurable as: Range switching 0-32 V 1 kΩ pull up 330 Ω pull down		AI_OUT2 PWM_HSD1_OUT2 DO_HSD1_OUT2 AI_INA_OUT2	Analog input 2 or PWM output ⁵ 2 or Digital output 2 and INA current sense		
A4	AI_A_IN4 FREQ_A_IN4 DO_RS4	Analog input 4 0-16 V or Frequency input 4 Input configurable as: Range switching 0-32 V	C2	AI_OUT1 PWM_HSD1_OUT1 DO_HSD1_OUT1 AI_INA_OUT1	Analog input 1 or PWM output⁵ 1 or Digital output 1 and INA current sense		
	PU_A_IN4 PD_A_IN4	1 kΩ pull up 330 Ω pull down		AI_OUTO	Analog input 0 or		
A5	AI_A_IN2 FREQ_A_IN2	Analog input 2 0-16 V or Frequency input 2		DO_HSD1_OUT0 AI_INA_OUT0	Digital output 0 and INA current sense		
	DO_RS2 PU_A_IN2 PD_A_IN2	Input configurable as: Range switching 0-32 V 1 kΩ pull up 330 Ω pull down	C4	AI_A_IN3 FREQ_A_IN3 DO_RS3	Analog input 0 0-16 V or Frequency input 0 Input configurable as: Range switching 0-32 V		
A6	AI_A_IN1 FREQ_A_IN1	Analog input 1 0-16 V or Frequency input 1 Input configurable as: Range switching 0-32 V 1 k Ω pull up 330 Ω pull down Analog input 3 or PWM output 3 ⁵ Digital output 3 or and INA current sense		PU_A_IN3 PD_A_IN3	1 kΩ pull up 330 Ω pull down		
	DO_RS1 PU_A_IN1 PD_A_IN1			AI_OUT7 PWM_HSD2_OUT7 DO_HSD2_OUT7 AI_INA_OUT7	Analog input 7 or PWM output⁵ 7 or Digital output 7 and INA current sense		
B1	AI_OUT3 PWM_HSD1_OUT3 DO_HSD1_OUT3 AI_INA_OUT3			AI_OUT6 PWM_HSD2_OUT6 DO_HSD2_OUT6 AI_INA_OUT6	Analog input 6 or PWM output ⁵ 6 or Digital output 6 and INA current sense		
B2	DI_INTERFACES_B	Digital input (depending on assembly options)	C8	AI_OUT5 PWM_HSD2_OUT5	Analog input 5 or PWM output⁵ 5 or		
В3	AI_ID	Analog input 0-16 V or ident pin		DO_HSD2_OUT5 AI_INA_OUT5	Digital output 5 and INA current sense		
B6	 AI_A_IN0 FREQ_A_IN0 DO_RS0 PU_A_IN0 Analog input 0 0-16 V or Input configurable as: Range switching 0-32 V PU_A_IN0 A IN0 A S30 Ω pull down 		⁴ min. switch-off time = 2.5 s ⁵ initial value with f = 1 kHz and 0% DC, DC switchable in 1‰ steps (1000=100%)				

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PIN FEATURE MAP

١/٥					
Pin	Analog Input	PWM output	Digital output		
B1	AI_OUT3	PWM_HSD1_OUT3	DO_HSD1_OUT3		
B8	AI_OUT4	PWM_HSD2_OUT4	DO_HSD2_OUT4		
C1	AI_OUT2	PWM_HSD1_OUT2	DO_HSD1_OUT2		
C2	AI_OUT1	PWM_HSD1_OUT1	DO_HSD1_OUT1		
C3	AI_OUT0	PWM_HSD1_OUT0	DO_HSD1_OUT0		
C6	AI_OUT7	PWM_HSD2_OUT7	DO_HSD2_OUT7		
C7	AI_OUT6	PWM_HSD2_OUT6	DO_HSD2_OUT6		
C8	AI_OUT5	PWM_HSD2_OUT5	DO_HSD2_OUT5		
		1	1		

	٨٢	alog inputs	T					Interfaces	
Pin	Signal	Description	¦∟,	FCU		Pin	Signal	Description	
	ALA IN5		1	LCO			LIN	LIN Master	
A3	FREQ A IN5	0-16 V/0-32 V/0-24.5 mA/RPM/PU			™ - M4F		CAN1 - H	second CAN Bus	
	AI_A_IN4		1	NXP S32K144			DI_INTERFACE2_A	Digital input	
A4	FREQ A IN4	0-16 V/0-32 V/0-24.5 mA/RPM/PU		Arm [®] Cortex [™] - M4F		A2	RS232_TX	RS232 Interface	
	ALA IN2		1	Clock frequency:80 MHz			DO_VREF_EN	Enable sensor supply 5 V	
A5	FREQ A IN2	0-16 V/0-32 V/0-24.5 mA/RPM/PU		Flash: 512 K			DCDC_8V5	Sensor supply 8.5 V	
	ALA IN1		Î	EEPROM: 2 K			AVI: 64 K	A7	DCDC_10V
A6	FREQ A IN1	0-16 V/0-32 V/0-24.5 mA/RPM/PU					CAN1 - L	second CAN Bus	
B3	AL ID	0-16 V/Ident	(emulated)		DI_INTERFACE2_B	Digital input			
				Ť		B2	RS232_RX	RS232 Interface	
B6	FREO A INO	0-16 V/0-32 V/0-24 5 mA/RPM/PU				B4	CAN0 - H	CAN Bus 0 high	
50			ſ.			C5	CAN0 - L	CAN Bus 0 low	
C4	FREQ_A_IN3	0-16 V/0-32 V/0-24.5 mA/RPM/PU							

Power Supply					
Pin	Signal	Description			
A1	AI_KL30_2	Supply voltage CPU, HSD pin B1, C1, C2, C3			
A8	AI_KL30_1	Supply voltage CPU, HSD pin B8, C6, C7, C8			
B5	DI_KL15	Ignition/ contact 15 according to DIN 72552			
B7		Ground / contact 31 according to DIN 72552			
B7		Ground / contact 31 according to DIN 72552			

BLOCK FUNCTION DIAGRAM



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TECHNICAL DRAWING IN MM [INCH], TOLERANCES ACCORDING TO ISO 2768-1 V

ASSEMBLY OPTIONS AND ORDER INFORMATION

	Inputs						Outputs	Seria	al Interfac	9	Wake-up source	Remarks
	A Voltage 0 – 16 V	B Voltage 0 – 30 V	C Current 0 - 24.5 mA	D Frequency Hz	E PT1000 1 kΩ pull up on sensor supply	I/O´s (can analog or o with	F be used as digital inputs PWM)	CAN Bus high speed	CAN- FD capable	LIN		G
1.154.211.00	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, }	B4, C5	B4, C5	A2	CAN, LIN, KL15, DO_ POWER	With 12 V LIN Bus (at 24 V power supply), sonsor supply only 12 V Activate LIN via VREF (DO_ VREF_EN and DCDC_10V)
1.154.300.00	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, }	A2, B2, B4, C5	B4, C5		CAN, KL15, DO_POWER	
1.154.300.04	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, 3	A2, B2 B4, C5	B4, C5		CAN, KL15, DO_POWER	without INA current sense
1.154.300.10	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, 3	A2, B2 B4, C5	B4, C5		-	Switching on - only contact 15 (B5), no wake up
1.154.310.00	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, 3	B4, C5	B4, C5	A2	CAN, LIN, KL15, DO_ POWER	
1.154.320.00	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, 3	B4, C5	B4, C5		CAN, KL15, DO_POWER	RS232 at A2 and B2
1.154.330.00	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, 3	B4, C5	B4, C5		CAN, KL15, DO_POWER	Digital inputs at A2 and B2
1.154.302.00	A3, A4, A5, A6, B3, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	A3, A4, A5, A6, B6, C4	B1, B8, C1 C6, C7, C8	, C2, C3, }	A2, B2, B4, C5	A2, B2, B4, C5		CAN, KL15, DO_POWER	2X CAN Bus, 2MB, AEF certified

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SCIP NUMBERS

Assembly Variant	SCIP Number
1.154.211.00	307c9271-3e32-4143-a40f-db7921c679dd
1.154.300.00	a6bfa1ec-a2e9-4959-a2d0-24fe80bb63f5
1.154.300.04	307c9271-3e32-4143-a40f-db7921c679dd
1.154.300.10	3a14d337-8cc5-444a-8d33-3bb26776fc4d
1.154.310.00	307c9271-3e32-4143-a40f-db7921c679dd
1.154.320.00	307c9271-3e32-4143-a40f-db7921c679dd
1.154.330.00	307c9271-3e32-4143-a40f-db7921c679dd
1.154.302.00	307c9271-3e32-4143-a40f-db7921c679dd

ACCESSORIES

Description	Order Number
Applics Studio Bundle	1.100.200.00
Cable set CC16WP for programming	110490
Connector package CC16WP	110421
PCAN-USB FD Interface	503750
Protection cap	111441
Corrugated tube (outer diameter: 21.2 mm; inner diameter: 16.5 mm)	Available from independent retailers

On request also available with matching DEUTSCH DT plug

Your advantages:

- High reliability and robust quality
- Use in extreme temperatures and high humidity

MANUFACTURER

MRS Electronic GmbH & Co. KG Klaus-Gutsch-Str. 7 78628 Rottweil

NOTES ON WIRING AND CABLE ROUTING

The electronic system and the power outputs of a control unit must be supplied by the same power supply system.

PWM outputs may not be connected with each other or bypassed.

The pins (I/Os) can be used in combination and may not be switched externally against a higher voltage level than supply voltage.

NOTES ON WIRING AND CABLE ROUTING

Higside outputs may only be switched to ground.

The sensor supplies can be "lifted" through an external circuitry, for example the creation of higher voltage, as they only work as a voltage source but not as voltage drain. The lift of a voltage source may lead to unforeseen malfunctions and damages of the control unit in case of permanent operation.

CAN bus communication is the main communication between the control unit and the vehicle. Therefore, connect the CAN bus with special care and check the correct communication with the vehicle to avoid undesired behavior.

NOTES ON WIRING AND CABLE ROUTING

When using the input with pull-down resistance (using DOM_PD), you must not connect a greater voltage than 9 V to the input.

To comply with the IP protection class, the wiring harness attached to the mating connector must be routed through the corrugated tube and the mating connector must be connected to the control unit. The protection cap is then closed over the mating connector and the corrugated tube.

SAFETY AND INSTALLATION INFORMATION

It is essential to read the instructions in full thoroughly before working with the device.

<u>Please note and comply with the instructions in the operating instructions and the information in the device data sheet, see www.mrs-electronic.com</u> **Staff qualification:** Only staff with the appropriate qualifications may work on this device or in its proximity.

SAFETY

WARNING! Danger as a result of a malfunction of the entire system.

Unforeseen reactions or malfunctions of the entire system may jeopardise the safety of people or the machine.
 Ensure that the device is equipped with the correct software and that the wiring and settings on the hardware are appropriate.

WARNING! Danger as a result of unprotected moving components.

Unforeseen dangers may occur from the entire system when putting the device into operation and maintaining it.

- Switch the entire system off before carrying out any work and prevent it from unintentionally switching back on.
- Before putting the device into operation, ensure that the entire system and parts of the system are safe.
- The device should never be connected or separated under load or voltage.

CAUTION! Risk of burns from the housing.

The temperature of the device housing may be elevated.

Do not touch the housing and let all system components cool before working on the system.

PROPER USE

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The device is used to control or switch one or more electrical systems or sub-systems in motor vehicles and machines and may only be used for this purpose. The device may only be used in an industrial setting.

WARNING!Danger caused by incorrect use.

The device is only intended for use in motor vehicles and machines.

- Use in safety-related system parts for personal protection is not permitted.
- Do not use the device in areas where there is a risk of explosion.

Correct use:

- operating the device within the operating areas specified and approved in the associated data sheet.
- strict compliance with these instructions and no other actions which may jeopardise the safety of individuals or the functionality of the device.

Obligations of the manufacturer of entire systems

It is necessary to ensure that only functional devices are used. If devices fail or malfunction, they must be replaced immediately.

System developments, installation and the putting into operation of electrical systems may only be carried out by trained and experienced staff who are sufficiently familiar with the handling of the components used and the entire system.

It is necessary to ensure that the wiring and programming of the device does not lead to safety-related malfunctions of the entire system in the event of a failure or a malfunction. System behaviour of this type can lead to a danger to life or high levels of material damage.

The manufacturer of the entire system is responsible for the correct connection of the entire periphery (e.g. cable cross sections, correct selection/ connection of sensors/actuators).

Opening the device, making changes to the device and carrying out repairs are all prohibited. Changes or repairs made to the cabling can lead to dangerous malfunctions. Repairs may only be carried out by MRS.

Installation

The installation location must be selected so the device is exposed to as low a mechanical and thermal load as possible. The device may not be exposed to any chemical loads.

Install the device in such a manner that the plugs point downwards. This means condensation can flow off the device. Single seals on the cables/leads must be used to ensure that no water gets into the device.

Putting into operation

The device may only be put into operation by qualified staff. This may only occur when the status of the entire system corresponds to the applicable guidelines and regulations.

FAULT CORRECTION AND MAINTENANCE

NOTE The device is maintenance-free and may not be opened.

• If the device has damage to the housing, latches, seals or flat plugs, it must be taken out of operation.

Fault correction and cleaning work may only be carried out with the power turned off. Remove the device to correct faults and to clean it.

Check the integrity of the housing and all flat plugs, connections and pins for mechanical damage, damage caused by overheating, insulation damage and corrosion. In the event of faulty switching, check the software, switches and settings.

Do not clean the device with high pressure cleaners or steam jets. Do not use aggressive solvents or abrasive substances.