

## **DREHMO® C-matic** **Electrical actuator with integral controls**

Complementary operating manual for drives with  
PROFIBUS DPV0/DPV1 interface



Operating manual

T.-Nr. 186619  
Version 1.6  
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### INFORMATION

*This operating manual has to be used in conjunction  
with the operating manual for actuators (from version 1.15)!*

*This manual must be kept for future use.*

## Document history

File revision	Date	Changes
0	2009-04-15	First release (T-OF)
1	2009-05-12	Review STE/WER
2	2010-03-08	S6.1 for Line redundancy described. Described additional acyclic parameters for phase sequence detection. (T-OF)
3	2011-04-02	Added chapter GSD Files. Updated description for FW-Download using Matic C Operator. (T-OF)
4	2011-03-28	Titel DPV1 replaced by DPV0/DPV1 (T-Ste)
5	2013-10-30	Description of the additional conventional I/O interface (parallel interface) (EE-ScMa)
6	2014-06-23	Intermediate position 1 and 2 in PPO1 and PPO2, TR11, DIM-10.4 (EE ScMa)

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# 1 Warnings and notes

## 1.1 Standards / directives

DREHMO products are designed and manufactured in compliance with recognised standards and directives. This is certified in a declaration of incorporation and a declaration of conformity.

The end user or the contractor must ensure that all requirements with respect to assembly, electrical connection, and commissioning at the place of installation are met.

They include among others:

- Applicable configuration directives for fieldbus applications.
- National regulations, laws, and prescriptions.

## 1.2 Commissioning (Electrical connection)

During operation of electrical devices it is unavoidable that certain parts carry dangerous voltages. All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.

## 1.3 Maintenance

Maintenance directives have to be carefully attended. Otherwise a safe operation of the actuator or control unit can't be assured.

## 1.4 Warnings and notes

Read these instructions carefully before installation and commissioning. Failure to follow them may lead to personal injury or to material damage.

The following signs draw special attention to safety-relevant procedures in these operation instructions:



This symbol signifies „additional information“.  
Failure to observe may lead to damage occurring.



This symbol signifies „attention“.  
Failure to observe may result in damage and personal injury.



This symbol signifies „warning!“.  
Failure to observe may result in damage and severe personal injury.



This symbol signifies „ESD hazardous device!“. Failure to observe may result in damage of the electronic assembly.

Handling of PCBs requires basic protection against damage through electrostatic discharge – ESD.

Before handling of PCBs discharge yourself with suitable action, for example touching an earthed part with connection to the device.

PCBs should be touched only at the side or at metallised mounting parts. Avoid direct contact to plug contacts and electronic parts on the PCB.

The PCB must not be placed on bare metal surfaces or potentially charged surfaces. In case of doubt use a capable ESD pad.

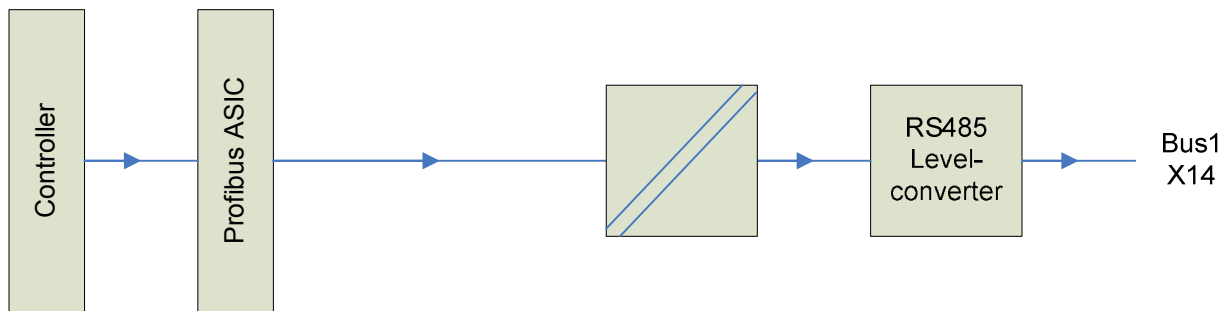
Transportation of single PCBs has to be done with ESD suitable packaging to avoid ESD damages.

## 2 Structure of the Profibus interface board

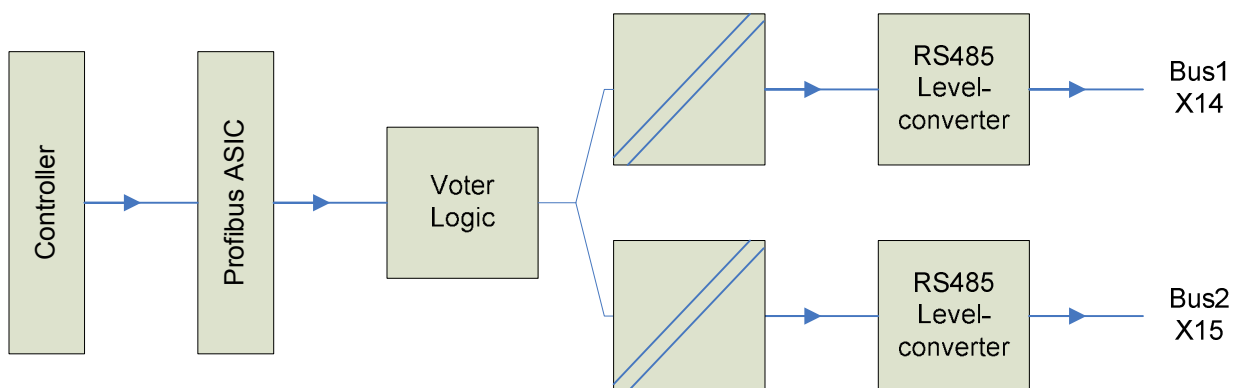
There are three different kinds of interface boards available. Depending on the desired type of usage (Single line, Line redundant, Master/Slave redundant) the interface board is equipped with different components.

The block diagrams are shown in the following:

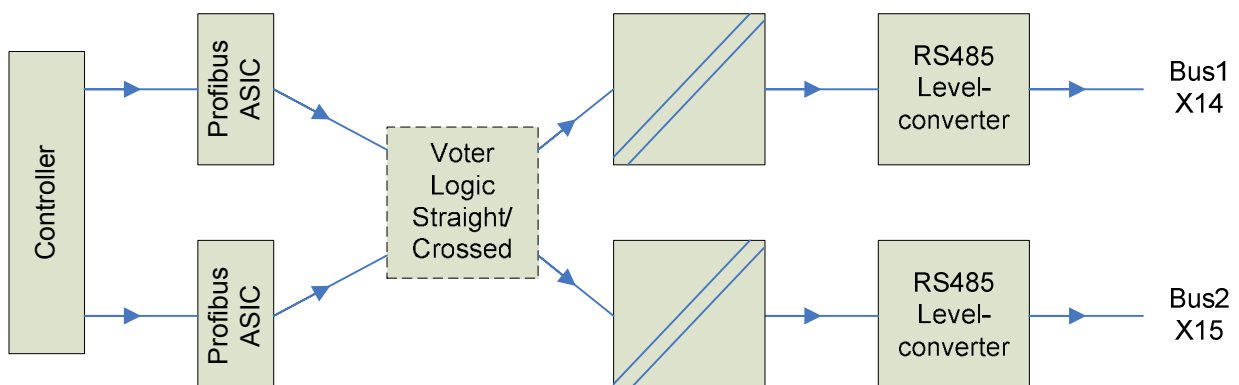
### Single ASIC Interface with 1-channel physical media access:



### Single ASIC Interface with 2-channel physical media access and voter logic:



### Dual ASIC Interface with 2-channel master/slave redundant physical media access and voter logic:



### 3 Electrical connection

#### 3.1 Mains connection (Standard)



Work on electrical equipment and electrical installation work on actuators must be carried out by electricians or under supervision by fully qualified engineers, in accordance with the valid electrical regulations.

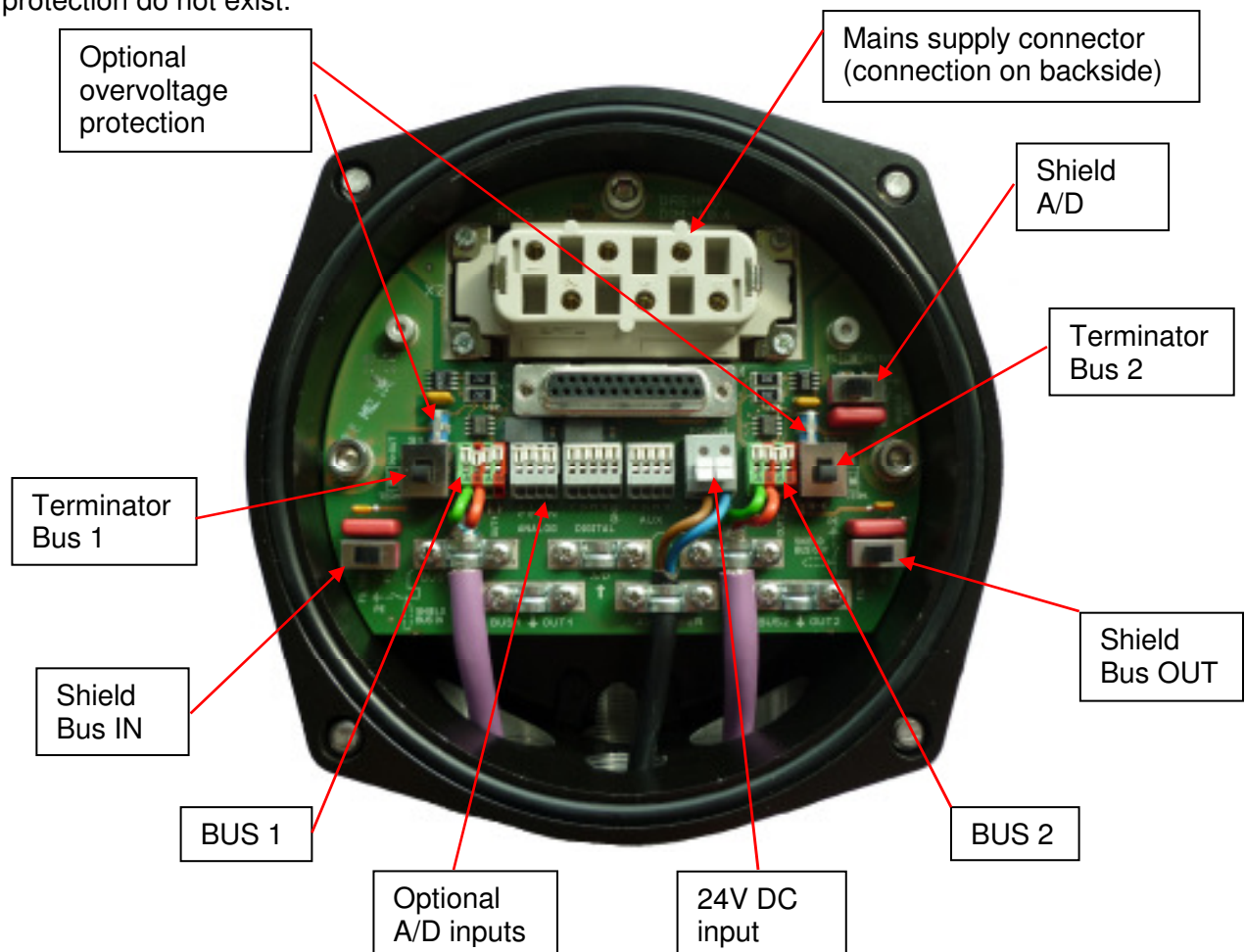
Wiring should be carried out according to the enclosed wiring diagram. All control cables shall be shielded to guarantee the electromagnetic compatibility of the actuator. The main power cable need not be shielded.

The overcurrent protection of the actuator has to be installed inside the power network. For rated values, see design data.

Pay special attention to the grounding of the actuator (refer to wiring diagram). Electrical protection is not obtained until all covers are closed.

#### 3.2 Bus connection (Standard)

Wiring is carried out according the wiring diagram supplied with the actuator. Locations of the connection terminals and switches are shown in the following picture. The picture shows the version for the redundant bus connection with overvoltage protection. Depending on the configuration it is possible, that the components for BUS 2, the optional inputs or the overvoltage protection do not exist.



Additionally to the electrical connection enabling/disabling the Profibus termination and the grounding of the shield is done on the connection board.

The circuit board is equipped with different connection terminals. The small connection terminal can be used for a wire cross section of up to 0,5mm<sup>2</sup>, the large connection terminal for up to 2,5mm<sup>2</sup>.

Table 1: Process structure

Connection terminal small – bus connection , optional inputs	AWG 20 - 28	0.08 – 0.5 mm <sup>2</sup>
Connection terminal large – external 24V input	AWG 12 - 20	0.5 – 2.5mm <sup>2</sup>

The bus circuit board DiM-10 is equipped with RS485 transceivers. For that reason the internal length of the stub cable does not affect the signal quality of the bus segment.



Pay attention to the ESD protection of the bus circuit board. Especially good personal earthing is required.

If the bus circuit board is disassembled from its housing transport and storage must meet ESD requirements.

### 3.3 Bus cable

Only cables according to IEC 61158 and 61784 standards, cable type A, may be used for Profibus DP wiring.

A maximum of 32 devices can be connected to a segment. If more devices should be connected to the Profibus connect the segments using repeaters. Respect a distance of minimum 20 cm between the bus cable and other cables. If possible, bus cables should be laid in a separate, conductive, and earthed cable tray.

Make sure to avoid potential differences between the individual devices on the bus (perform a potential equalisation).

For Profibus wiring the directives for segment length and maximum spur/stub length have to be observed.

Bitrate [kbit/s]	Bit time	Max. segment length [m]	Max. stub length [m]
9,6	104 µs	1200	500
19,2	52 µs	1200	500
45,45	22 µs	1200	100
93,75	10.6 µs	1200	100
187,5	5.3 µs	1000	33
500	2 µs	400	20
1500	666 ns	200	6,6
3000	333 ns	100	-
6000	166 ns	100	-
12000	83 ns	100	-

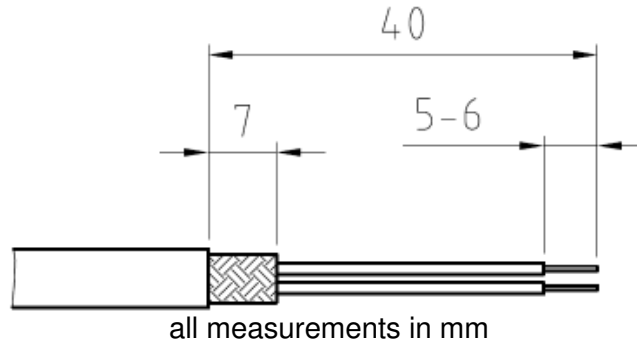
#### Connection data:

Strip length:	5 to 6 mm
Wire insertion angle relative to PCB:	40°
Connection technology:	CAGE CLAMP® PCB terminal with slider (WAGO series 218)
Cross section (solid-conductor):	0.08 to 0.5 mm <sup>2</sup> ; AWG 28 to 20
Cross section (multi-conductor):	0.08 to 0.5 mm <sup>2</sup> ; AWG 28 to 20
Cross section (multi-conductor):	up to 0.25 mm <sup>2</sup> , AWG 28 to 23 (ferrule without plastic shroud allowed)



## Connection:

- Insertion of the PROFIBUS cable trough the cable glands
- The shielding clamps for the PROFIBUS cables have to be removed
- The PROFIBUS cable and wires have to be prepared according the following drawing



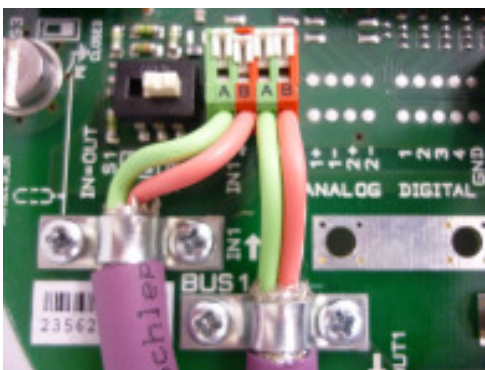
Preparation of the PROFIBUS cable and wires



## Pictures:

PROFIBUS cable without ferrule and multi-conductor with ferrule

- In order to open the terminal contact, the slider has to be pushed forward or the contact spring (in front of the slider) has to be pushed down with a screwdriver (blade width 2.5 to 3.5 mm)
- The PROFIBUS wire has to be inserted in an angle of approximately  $40^\circ$  relative to the PCB board plane into the terminal. The slider has to be pushed backwards afterwards to fasten the conductor (if a ferrule without plastic shroud is used, due to the commonly ferrule length of approx. 7mm, the conductor isolation doesn't immerge totally inside the terminal inlet).



Picture: PROFIBUS terminals

- The shielding of the PROFIBUS cable has to be tightened securely by means of the respective cable clamps
- The cable glands have to be fastened with the prescribed torque value in order to guarantee the specified IP grade.

For the crimping of the ferrules we recommend the usage of the crimping tool from company WAGO - Variocrimp 4. Uniform, compact crimping on all four sides for high conductor retention is best suited for the used terminals.



### 3.4 Shield connection

The strain relief clamps for the PROFIBUS cable and the A/D input cable may be used for the cable shielding – instead of the preferred usage of EMC cable glands. The strain relief clamps are electrical connected via a RC combination to the housing. By means of this, highly frequent signals can be deflected to the housing. Current flow over the shielding due to stray electric currents in the overall plant installation can be avoided. In case of a good potential equalization between the connected field devices, the RC combinations can be short-circuit via the according switches in order to have an optimized conduction of possible disturbance signals from the cable shield to the housing.

### 3.5 Bus termination

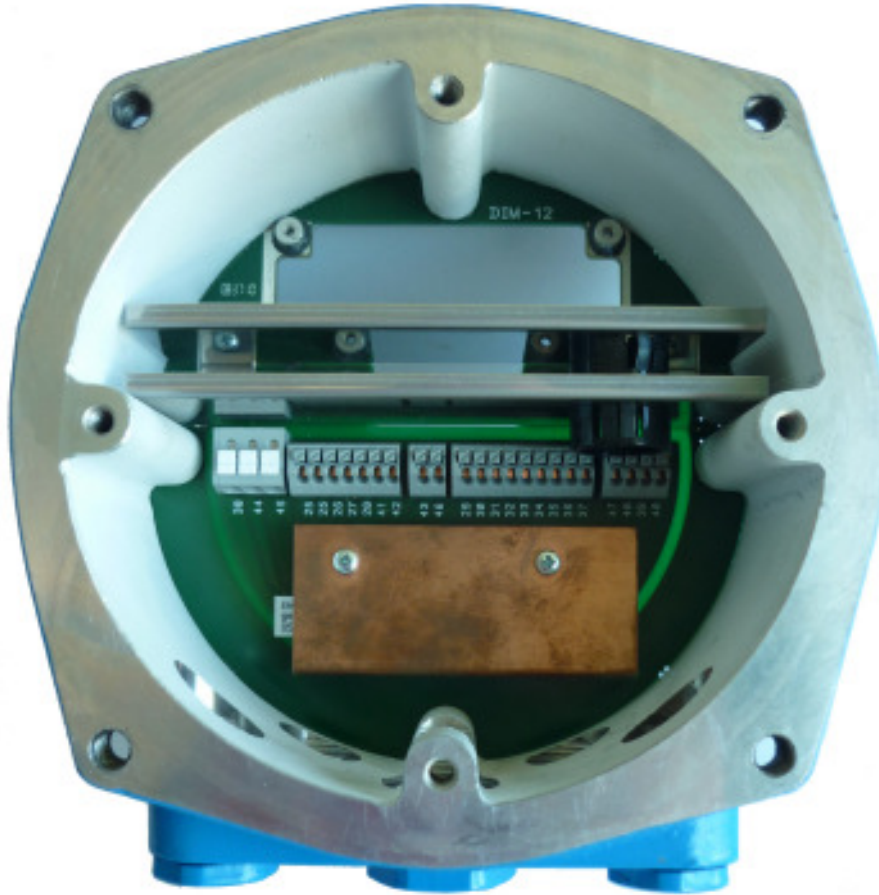
RS485 segments have to be terminated and conditioned at the beginning and the end in order to define the signal levels and avoid signal reflections. On the appropriate actuators, the termination switch S1 for BUS1 and S2 for BUS2 has to be in position „TERM“ (termination active). If the termination is active, the outgoing PROFIBUS signal is decoupled from the incoming signal. By means of this, subsequent field devices are disconnected from the master. If subsequent field devices are existing, the termination switch S1 resp. S2 have to be in the position „IN=OUT“ (termination inactive).



Active conditioning of the fieldbus signals in case of activated termination is only given, if the actuator electronic is powered via the mains power connection or the optional existing external 24V DC supply.

### 3.6 Additional conventional I/O interface (parallel interface)

If the actuator is equipped with a conventional I/O interface in parallel to the PROFIBUS connection, there is a separate intermediate connector housing mounted between the compact plug cover and the actuator housing. By means of this, additional wiring space and additional available cable entries are given. Separate connectors for the conventional input and output signals according to the wiring diagram are mounted on an additional PCB.



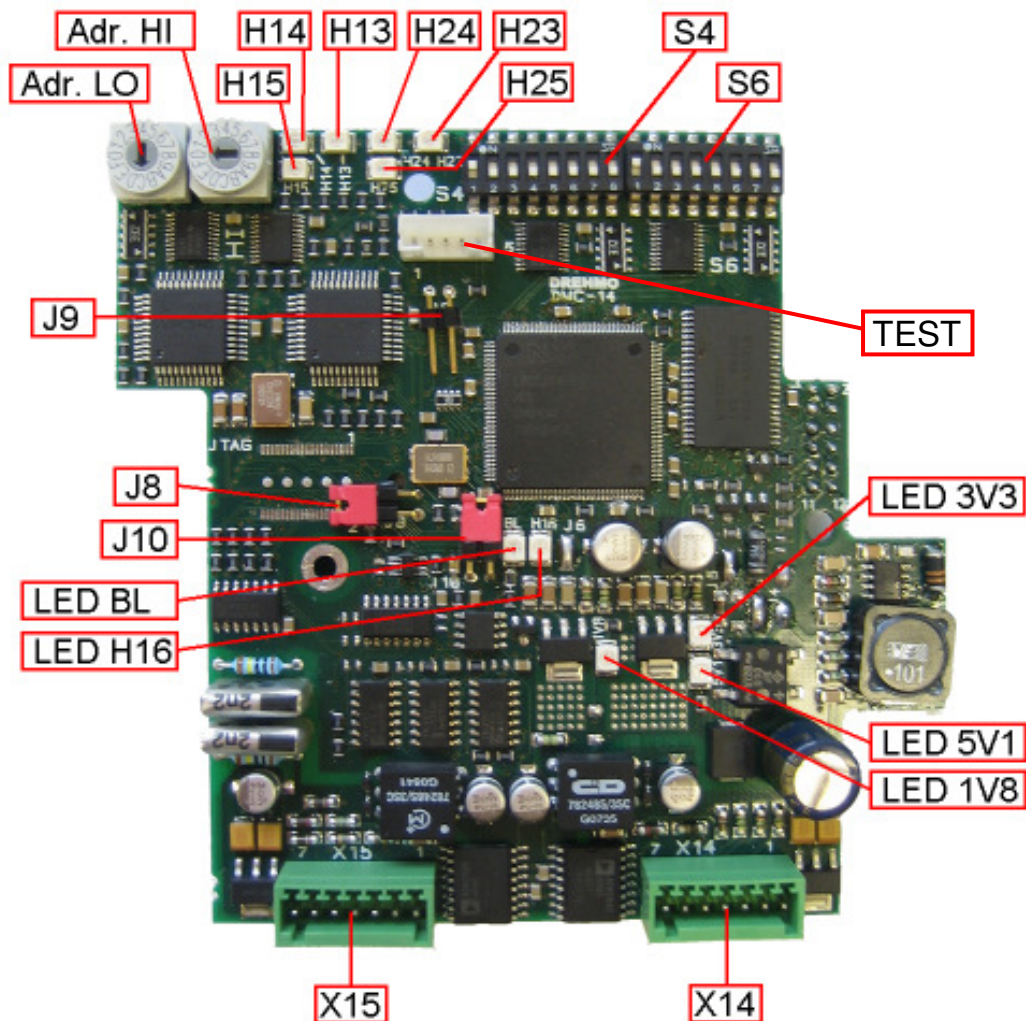
Picture: Intermediate connector housing with the integrated PCB connector board for the conventional I/O signals

The mains power connector in those applications is no longer mounted inside the compact plug cover. Instead it is mounted on the connector board for the conventional I/O signals inside the intermediate connector housing.

The PROFIBUS signals are wired from the actuator housing side towards the compact plug cover side through the intermediate housing via an additional D-Sub connector cable.

## 4 Switches / LED's of the interface board

### 4.1 Location of the components on the interface board



### 4.2 Jumper

The system behaviour can be controlled by 3 jumpers. They are marked as follows:

Jumper	Meaning	Description
J8	HW-Watchdog Reset out	Routes the Reset output of the external watchdog supervisory circuit to the reset input of the controller. This enables the watchdog circuit to reset the controller in case of under voltage or watchdog tripping. For normal operation this jumper must be closed.
J9	Bootloader Jump	Causes the controller to enter the bootloader routines upon system restart for firmware download. This disables the user code from executing. For normal operation this jumper must be open.
J10	HW-Watchdog Watchdog in	Routes the controller generated watchdog trigger signal to the supervisory circuit. This enables the external watchdog logic. If the jumper is left open the external watchdog logic will be disabled. For normal operation this jumper must be closed.

## 4.3 DIL-Switches

### 4.3.1 Profibus Address HI / LO

The Profibus address is controlled via the hexadecimal coded switches hex switch Adr. HI + LO. The switch marked with HI sets the higher nibble, the switch marked with LO sets the lower nibble of the address value.

The switches control the basic address of the primary channel, from witch, depending on the selected redundancy concept, the address of the higher channel is calculated.

The basic address can be selected in a range from 2 to 125. Settings out of this given range are not permitted and disable the Profibus interface. If the address of the second channel is calculated with an offset of 64 the Bit 2 of the HI Nibble switch is masked out. Therefore only settings in the range of 2 to 61 make sense in this case. For the second channel the bit 2 is forced resulting in an address range from 66 to 125 for this channel.

Possible address settings:

HI	LO	ADR	HI	LO	ADR	HI	LO	ADR	HI	LO	ADR
0	0	NA	1	0	16	2	0	32	3	0	48
0	1	NA	1	1	17	2	1	33	3	1	49
0	2	2	1	2	18	2	2	34	3	2	50
0	3	3	1	3	19	2	3	35	3	3	51
0	4	4	1	4	20	2	4	36	3	4	52
0	5	5	1	5	21	2	5	37	3	5	53
0	6	6	1	6	22	2	6	38	3	6	54
0	7	7	1	7	23	2	7	39	3	7	55
0	8	8	1	8	24	2	8	40	3	8	56
0	9	9	1	9	25	2	9	41	3	9	57
0	A	10	1	A	26	2	A	42	3	A	58
0	B	11	1	B	27	2	B	43	3	B	59
0	C	12	1	C	28	2	C	44	3	C	60
0	D	13	1	D	29	2	D	45	3	D	61
0	E	14	1	E	30	2	E	46	3	E	62
0	F	15	1	F	31	2	F	47	3	F	63

HI	LO	ADR	HI	LO	ADR	HI	LO	ADR	HI	LO	ADR
4	0	64	5	0	80	6	0	96	7	0	112
4	1	65	5	1	81	6	1	97	7	1	113
4	2	66	5	2	82	6	2	98	7	2	114
4	3	67	5	3	83	6	3	99	7	3	115
4	4	68	5	4	84	6	4	100	7	4	116
4	5	69	5	5	85	6	5	101	7	5	117
4	6	70	5	6	86	6	6	102	7	6	118
4	7	71	5	7	87	6	7	103	7	7	119
4	8	72	5	8	88	6	8	104	7	8	120
4	9	73	5	9	89	6	9	105	7	9	121
4	A	74	5	A	90	6	A	106	7	A	122
4	B	75	5	B	91	6	B	107	7	B	123
4	C	76	5	C	92	6	C	108	7	C	124
4	D	77	5	D	93	6	D	109	7	D	125
4	E	78	5	E	94	6	E	110	7	E	NA
4	F	79	5	F	95	6	F	111	7	F	NA

NA) This combination is not permitted.

### 4.3.2 DIL Switch S4

Bit	Value	Description
<b>1</b>		<b>Enable Host communication</b>
	0	Host communication disabled. (Only for testing purposes)
	1	Host communication enabled. (Default)
<b>3.2</b>		<b>Reserved</b>
<b>6.4</b>		<b>Fail safe delay time (Added to the watchdog timeout provided by the Profibus Master)</b>
	000	0 Seconds
	001	5 Seconds
	010	10 Seconds
	011	20 Seconds
	100	40 Seconds
	111	Fail safe disabled
<b>7</b>		<b>Fail Safe behaviour on GCC (Global Control Clear)</b>
	0	Fail as is on GCC
	1	Fail safe on GCC
<b>8</b>		<b>Simulate external diagnosis</b>
	0	No simulation of external diagnosis (default)
	1	Simulate external diagnosis (only for testing purposes)

### 4.3.3 DIL Switch S6

Bit	Value	Description	
<b>1</b>		<b>Address offset of second Profibus channel (Only for Dual ASIC)</b>	
	0	No address offset for second channel	
	1	Address offset 64 for second channel	
<b>1</b>		<b>Line redundancy monitoring/switching (only if S6.4 and S6.5 = 1)</b>	
	0	Use fast monitoring/switching mechanism	
	1	Switch channel only in case of slave watchdog tripping	
<b>3.2</b>		<b>PNO ID selection for emulation mode</b>	
	00	Matic C DPV1 (DUAL ASIC: 0x0C26 / SINGLE ASIC: 0x0C27)	
	01	Matic C DPV0 (0x0686)	
	10	AUMA (0x05CD)	
	11	SIPOS (DUAL ASIC: 0x056E / SINGLE ASIC: 0x056D)	
<b>5.4</b>		<b>Redundancy mode Protocol / Media access</b>	
		<b>Dual ASIC</b>	<b>Single ASIC</b>
	00	DREHMO redundancy GSD-File: DREM0C26	No redundancy; 1 ASIC on channel 1 GSD-File: DREM0C27
	01	System redundancy acc. PNO Spec. 2212 GSD-File: DREM0C26	No redundancy; 1 ASIC on channel 1 GSD-File: DREM0C27
	10	ABB redundancy GSD-File: DREM0C26	No redundancy; 1 ASIC on channel 1 GSD-File: DREM0C27



	11	Line redundancy (1 ASIC oper.) GSD-File: DREM0C27	Line redundancy GSD-File: DREM0C27
<b>6</b>		<b>Redundancy response (only if S6.4 and S6.5 = 1)</b>	
	0	Redundancy reply on active channel	
	1	Redundancy reply on both channels	
<b>7</b>		<b>Position output Profibus</b>	
	0	Output limited to 0..1000 or 46..230	
	1	Output with over- / underflow	

## 4.4 Diagnosis LED's

### 4.4.1 LED 1V8, 3V3 und 5V1

These LED group indicates the presence of the different supply voltages. For accurate operation the presence of all voltage levels is essential. If one or more of these LED's are off, this indicates a serious damage.

### 4.4.2 LED BL

The LED indicates the correct program execution flow with a flash rate of 1Hz. If the LED keeps off the user program is not executed. In this case the interface board either is malfunctioning, the Firmware is missing or the Bootloader mode for firmware download is activated.

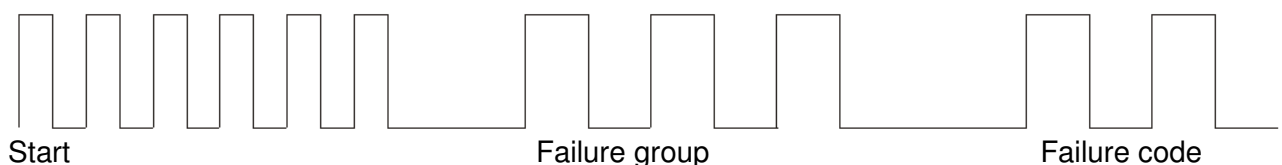
### 4.4.3 LED H16 DIAG

The LED indicates possible failures by flashing with two different frequencies. If the LED is off no failure is recognized by the controller logic.

If more than one failure is recognized always the failure with the lowest group / code will be signalled.

#### Flash code

Fast flash	Start of sequence
First slow sequence	Failure group
Second slow sequence	Failure code



Failure group	Failure code	
<b>1 Pulse</b>		<b>System failures</b>
	1	RAM-Test Failure. The internal memory test failed.
	2	Failure test ASIC channel 1
	3	Failure test ASIC channel 2
	4	NV-Memory failure. Failure accessing the non volatile memory.
	5	Hardware data failure. The hardware settings of the board are missing.
<b>2 Pulses</b>		<b>Configuration failures</b>
	1	Host communication disabled. S4.1 = 0
	2	Invalid Profibus address
	3	Board not equipped with necessary hardware
	4	Board not equipped with necessary medium voter
<b>3 Pulses</b>		<b>Application failures</b>
	1	Communication to host timed out

#### 4.4.4 LED H13/H23 (Yellow)

The LED indicates, depending on the selected redundancy concept, the primary channel of the interface. On single channel interface boards the LED H13 is always on.

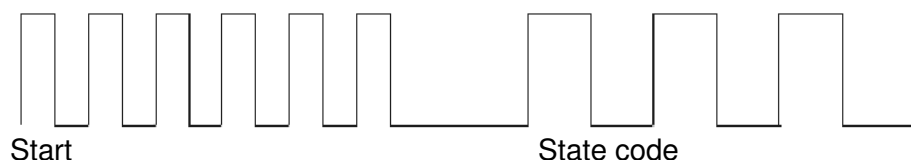
	Dual ASIC	Single ASIC with line redundancy
H13	ASIC 1 is primary	ASIC accesses media via BUS 1
H23	ASIC 2 is primary	ASIC accesses media via BUS 2

#### 4.4.5 LED H14/H24 Profibus physically state (Green)

The LED indicates the physical state of the respective Profibus channel. H14 indicates the state of channel 1, H24 the state of the channel 2.

The LED displays the state by flashing with two different frequencies or it is permanent on or off.

Fast flash	Start of sequence
First slow sequence	State code



The following states will be signalled:

H14/H24	State
Off	Board is not equipped with ASIC for this channel or the ASIC is disabled
1 Pulse	Profibus ASIC is in state Reset
2 Pulses	Profibus ASIC is in state Passive Idle
3 Pulses	Profibus ASIC is in state baud rate detection
On	Profibus ASIC has detected a valid baud rate



#### 4.4.6 LED H15/H25 Profibus protocol state (Green)

The LED indicates the protocol state of the respective Profibus channel. H15 indicates the state of channel 1, H25 the state of the channel 2. The LED indicates the states as described in the former chapter.

The following states will be signalled:

H15/H25	State
Off	For channel state please refer to LED H14/H24
1 Pulse	Profibus ASIC is in state WaitPrm. No SetPrm telegram or a SetPrm with invalid PNO-ID was received.
2 Pulses	Profibus ASIC is in state WaitPrm. A SetPrm telegram with invalid parameters was received.
3 Pulses	Profibus ASIC is in state WaitCfg. No CheckCfg telegram was received.
4 Pulses	Profibus ASIC is in state WaitCfg. A CheckCfg telegram with invalid configuration was received.
5 Pulses	Profibus ASIC is in state GCC. A GCC telegram was received
6 Pulses	General failure in state machine/Illegal state.
On	Profibus ASIC is in state Data Exchange.

#### 4.4.7 TEST connector

The TEST connector offers extended diagnostic and update possibilities in combination with the DREHMO USB adapter and the PC-Tool Matic C Operator.

## 5 Profibus Interface

### 5.1 GSD-Files

For device integration into engineering tools different GSD-files are available. The selection of the right GSD file depends on the equipment of the interface board (1 or 2 ASIC's) and the selected redundancy concept setting via S6.4 and S6.5. The number of ASIC's can be determined by looking at the interface board. The ASIC's are the square chips located beneath the coding switches for the bus address.

S6		Redundancy mode Protocol / Media access	
Bit	Value	Dual ASIC	Single ASIC
5.4			
	00	DREHMO redundancy GSD: DREM0C26	No redundancy; 1 ASIC on channel 1 GSD: DREM0C27
	01	System redundancy acc. PNO Spec. 2212 GSD: DREM0C26	No redundancy; 1 ASIC on channel 1 GSD: DREM0C27
	10	ABB redundancy GSD: DREM0C26	No redundancy; 1 ASIC on channel 1 GSD: DREM0C27
	11	Line redundancy (1 ASIC oper.) GSD: DREM0C27	Line redundancy GSD: DREM0C27

Remark:

The list of GSD files is only valid for PNO ID selection Matic C DPV1 according S6.2=0 and S6.3=0.

## 5.2 Set parameter telegram

### 5.2.1 Standard parameter (7 Bytes)

The Profibus interface supports parameterization with different PNO-IDs in Byte 5 and 6 of the standard parameters, which can be set by DIL switch S6.

This enables the operation of the device with control stations using 3rd party parameterizations.

The other bytes of the standard parameters have the meaning as described in Profibus specifications.

Single ASC	Dual ASIC	PNO Id of
0C27	0C26	Matic C DPV1
0686	0686	Matic C DPV0
05CD	05CD	AUMA
056D	056E	SIPOS

### 5.2.2 User specific parameters (UsrPrm data)

The interface accepts a different amount of user parameter data:

Length	Usr_Prm	Description
3	80 00 00	Default value. 3 DPV1 bytes.
5	00 00 00 00 00	Matic C DPV0 compatible 3 DPV1 bytes. Matic C DPV1 user specific (Reserved, always = 00)
4	80 00 00 00	Sipos compatible 3 DPV1 bytes. Sipos user specific (Activation of internal position controller (If equipped). 00=disabled; 01=enabled)
37	80 00 00 00 .. 00	AUMA compatible 3 DPV1 bytes. 34 bytes acc. AUMA GSD

The parameter telegram can be extended with a block of 8 bytes for the parameterization by the RedCom layer.

## 5.3 Process images

### 5.3.1 PPO1: (Default)



This process image has no command STOP for the version V005 (internal position controller). Carefully check the setting of the DIL switch S1.1 in conjunction with the switch S2.8 on the base plate. If S2.8 is 1 the switch S1.1 must be set to 0. In case of incorrect settings malfunctioning of the device can occur.

This process image is activated by the following configuration:

Length	Cfg	Description
2	97 A3	Default value: 8 bytes input / 4 bytes output
2	53 61	SIPOS compatible: 4 words input / 2 words output
2	1B 23	AUMA compatible: 12 bytes input / 4 bytes output *)

\*) Additional input bytes will be filled with 0.

#### Input data (Data from actuator to controller)

Byte	Bit	Cfg	Signal	Description
0	0	All	Final position OPEN	Final position indication according to settings
	1	All	Final position CLOSE	Final position indication according to settings
	2..	All	Reserved	
	3			
	4	All	Running OPEN	Running indication OPEN
	5	All	Running CLOSE	Running indication CLOSE
	6	All	Reserved	
7	All	Collective fault	Collective fault indication	
1	0	All	Thermal protection	Thermal motor protection tripped
	1	97 A3	Collective fault 1	Collective fault according to settings
		53 61	-	-
		1B 23	-	-
	2	All	Mode REMOTE	Actuator can be controlled by external commands
	3	All	Mode LOCAL	Actuator can be controlled by local commands
	4	All	Position switch OPEN	Final position indication
5	All	Position switch CLOSE	Final position indication	
6	All	Torque OPEN	Torque monitoring tripped OPEN	
7	All	Torque CLOSE	Torque monitoring tripped CLOSE	
2			Actual position HI	Actual position indication
3			Actual position LO	(CLOSED = 0 Dez / OPENED = 1000 Dez)
4	0	All	Illegal command	Setpoint <0 or > 1000; Multiple commands *)
	1	All	Mode not REMOTE	Actuator cannot be controlled by external commands
	2	All	Thermal protection	Thermal motor protection tripped
	3	All	-	-
4	All	Torque OPEN	Torque monitoring tripped OPEN	

Byte	Bit	Cfg	Signal	Description
	5	All	Torque CLOSE	Torque monitoring tripped CLOSE
	6	All	CLEAR	A Global control clear was received
	7	All	Reserved	
5	0	All	Reserved	
	1	All	Channel 2 active	Communication via channel 2 in redundancy mode
	2	All	Failure position feedback	Failure of combined sensor or position feedback
	3	All	Failure position feedback	Failure of combined sensor or position feedback
	4	All	-	-
	5	All	-	-
	6	All	Hand wheel operation	Actuator is moved by hand wheel *)
	7	All	Operation time monitoring	Operation time OPEN / CLOSE exceeded *)
6	0	All	Step pause	Stepping mode pause *)
	1	All	Step proportional	Stepping mode proportional mode *)
	2	All	Step operation	Stepping mode operation *)
	3	All	Step area	Actuator is within stepping area *)
	4	All	Running OPEN / Intermediate pos. 1	Running indication OPEN (TR11 open) / Intermediate position 1 (TR11 closed) ***)
	5	All	Running CLOSE / Intermediate pos. 2	Running indication CLOSE (TR11 open) / Intermediate position 2 (TR11 closed) ***)
	6	All	Local operation OPEN	Actuator is running in OPEN direction in LOCAL mode
	7	All	Local operation CLOSE	Actuator is running in CLOSE direction in LOCAL mode
7	0	All	Digital input 0 **)	Command STOP/AUTO
	1	All	Digital input 1 **)	Command CLOSE
	2	All	Digital input 2 **)	Command OPEN
	3	All	Digital input 3 **)	Additional input E1
	4	All	Digital input 4 **)	Additional input E2
	5	All	Digital input 5 **)	Intermediate position 1
	6	All	Digital input 6 **)	Intermediate position 2
	7	All	-	-

\*) Not supported yet

\*\*\*) Only with PNO-ID Matic C and AUMA (S6.2 / S6.3), otherwise always = 0

\*\*\*\*) Depending on TR11 setting on the base board of the control unit (from FW 1.05.0020 at DMC-14)

### Output data (Data from controller to actuator)

Byte	Bit	Signal	Description
0	0	Command OPEN	Command OPEN, if AUTO = 0
	1	Command CLOSE	Command CLOSE, if AUTO = 0
	2	Command AUTO (V005)	Activates the internal position controller (Position controlling according setpoint / actual value comparison)
		Command STOP (V003)	Stops the actuator. (Signal has higher priority than CLOSE and OPEN)
	3	Fault acknowledge	Reset mechanism for specific tripped faults. (e.g. Torque tripping) *)

	4..7	Reserved	
1	0..7	Reserved	
2		Setpoint HI	Position setpoint for positioner
3		Setpoint LO	(CLOSE = 0 Dez / OPEN = 1000 Dez)

\*) Not supported yet

### 5.3.2 PPO2: (Matic C compatible)

This process image is activated by the following configuration:

Length	Cfg	Description
2	21 11	Default value: 2 bytes input / 2 bytes output

#### Input data (Data from actuator to controller)

Byte	Bit	Signal	Description
0	0	Collective fault	Collective fault indication
	1	Running OPEN / Intermediate pos. 1	Running indication OPEN (TR11 open) / Intermediate position 1 (TR11 closed) **)
	2	Running CLOSE / Intermediate pos. 2	Running indication CLOSE (TR11 open) / Intermediate position 2 (TR11 closed) **)
	3	Mode REMOTE	Actuator can be controlled by external commands
	4	Final position OPEN	Final position indication according to settings
	5	Final position CLOSE	Final position indication according to settings
	6	Switch off OK OPEN	Switch off OK in OPEN direction *)
	7	Switch off OK CLOSE	Switch off OK in CLOSE direction *)
1	0..7	Actual position	Position feedback (CLOSE = 46 Dez / OPEN = 230 Dez)

\*) Not supported yet

\*\*) Depending on TR11 setting on the base board of the control unit (from FW 1.05.0020 at DMC-14)

#### Output data (Data from controller to actuator)

Byte	Bit	Signal	Description
0	0	Command AUTO	Activates the internal position controller (Position controlling according setpoint / actual value comparison)
	1	Command STOP	Stops the actuator. (Signal has higher priority than AUTOMATIK, CLOSE and OPEN)
	2	Command CLOSE	Command CLOSE, if AUTO = 0
	3	Command OPEN	Command OPEN, if AUTO = 0
	4..7	Reserved	
1	0..7	Setpoint	position setpoint for position controller (CLOSE = 46 Dez / OPEN = 230 Dez)

## **5.4 Acyclic data**

The access on the acyclic parameters is possible by means of the DPV1 services MSAC1 and MSAC2. The used data types are conform to the PROFIBUS-PA definitions.

A detailed listing of the overall acyclic data model is not given here, because the access out of the PLC or DCS system is either done via a DDL (Device Description Language) or a DTM (Device Type Manager).

DDL or DTM can be downloaded from the DREHMO homepage or can be ordered free of charge via the DREHMO service.

## 6 System functions

### 6.1 Diagnostics

PC based diagnosis is possible by means of a separate available dedicated USB adaptor kit in conjunction with the PC tool Matic C Operator. Further details on that are given in the corresponding manuals.



If the electronic is equipped with a PROFIBUS board, the interface connection has to be done in any case via the TEST connector on the PROFIBUS interface board. The interface connection on the main board is not available in this hardware configuration.

### 6.2 Firmware download



The following chapter describes deeper interventions into system functions. Thus the described actions should be carried out only by professional well trained personnel. Faulty operation or failures could result in major damages.

The controller located on the interface board offers the possibility to update the firmware for system treatment or for the implementation of new functionality.

#### 6.2.1 Required items

- Drehmo USB-Adapter-Kit
- Test plug SER01 with reset switch (included in Drehmo USB-Adapter-Kit)
- PC equipped with Windows operating system
- Programming software Matic C Operator
- HEX-File with new Firmware

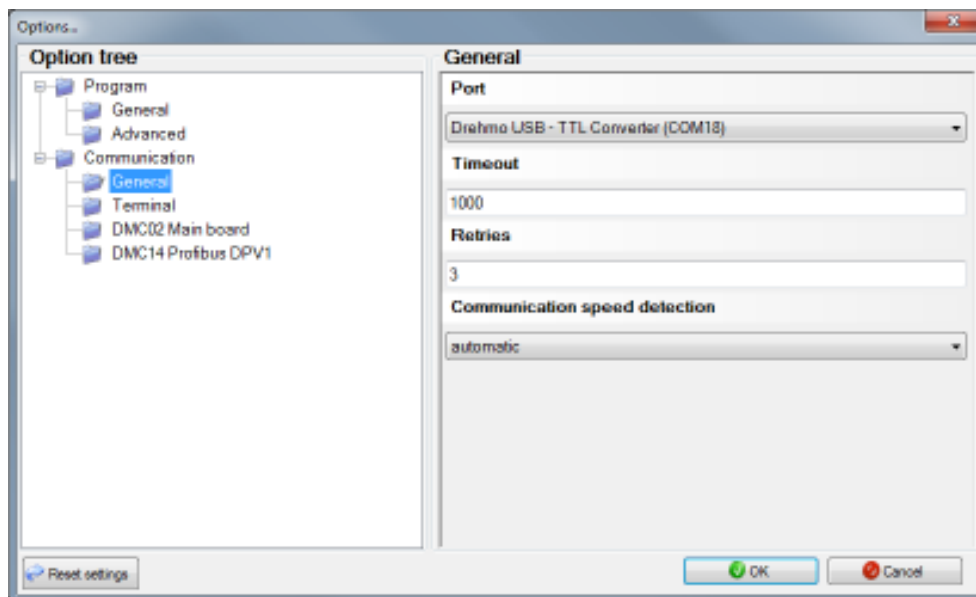
#### 6.2.2 Step by step description

- 1.) Power off actuator to avoid serious damages to the electronic due to high signal differences
- 2.) Connect the serial Com-Port of the PC to the 5-pole TEST connector of the interface board
- 3.) Power on the actuator
- 4.) Start PC Firmware Download Tool

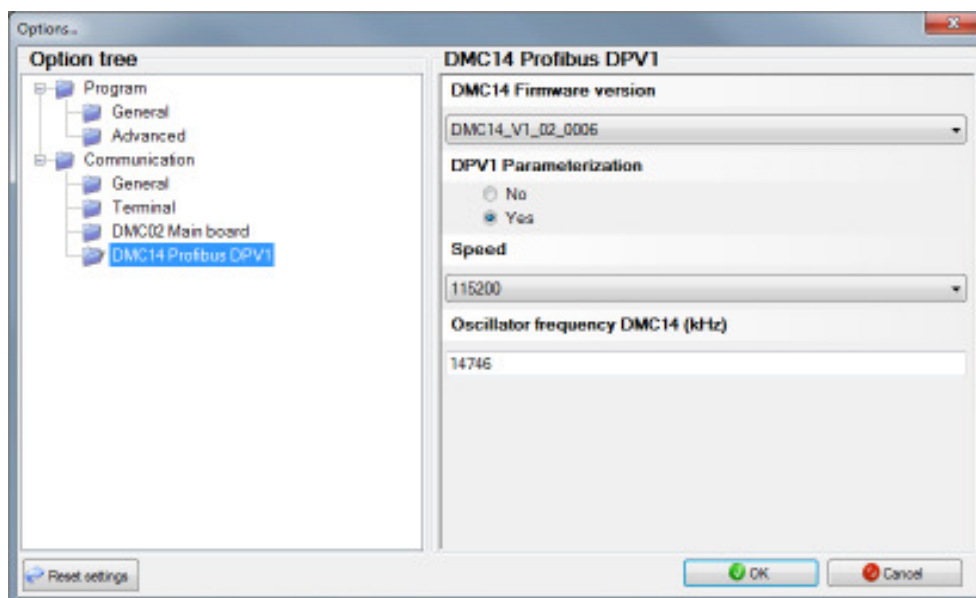


## Downloading firmware using Matic C Operator

- 1.) Select the used communication port to which the RS232/TTL level converter is connected. Communication port setting is done via menu entry *Extras->Options*. Within the option tree the entry *Communication -> General* has to be selected.

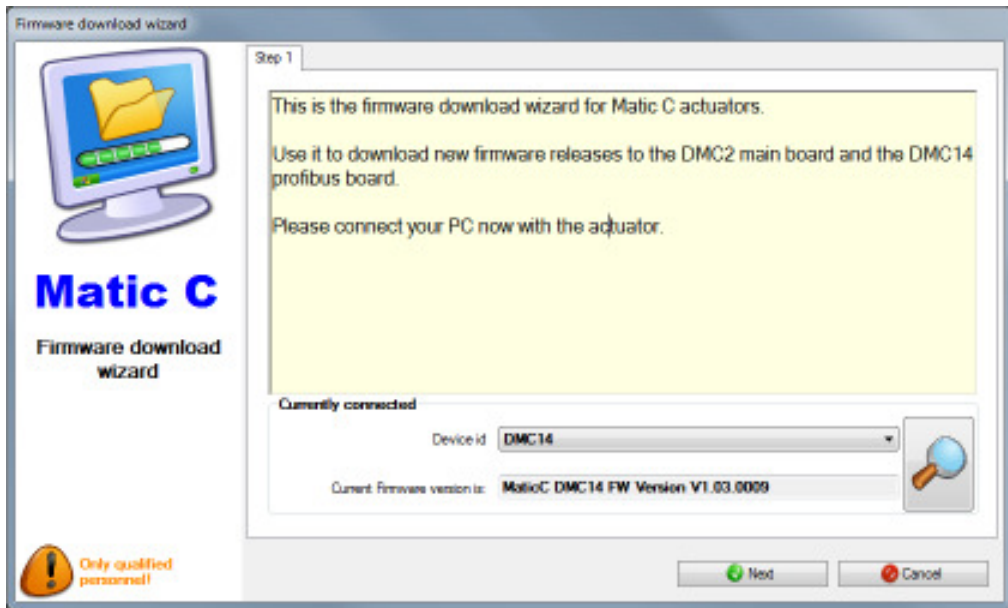


- 2.) Choose the transmission speed for the entry *DMC14 Profibus DPV1*. The transmission speed 115200 Baud is the highest selectable speed. This speed can only be used under ideal circumstances. A save and secure connection can be achieved by selecting a speed of 57600 Baud. If the connection still fails during the transmission it is advised to further reduce the speed.

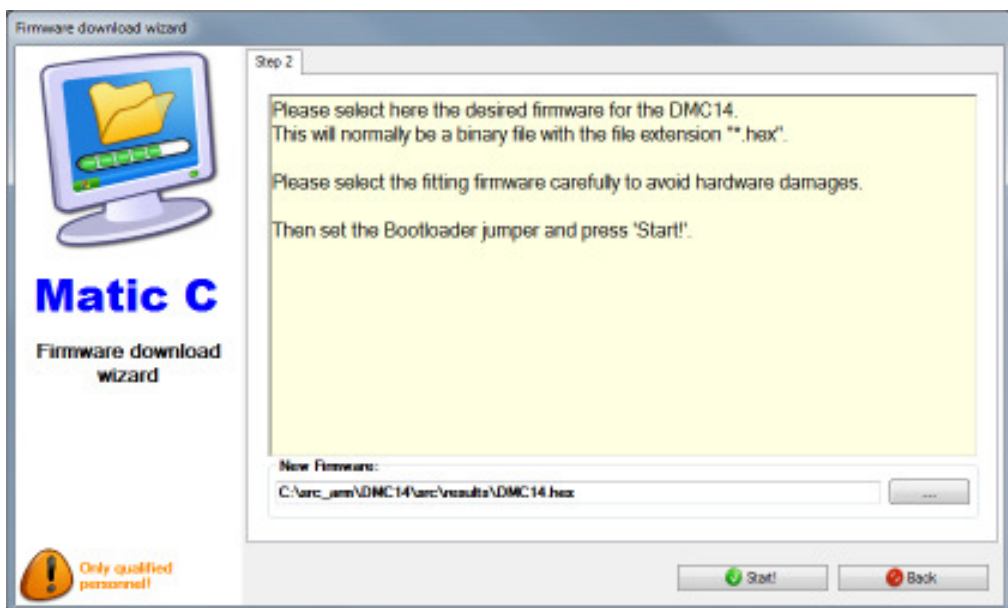


- 3.) Set the oscillator frequency in kHz. The controller of the interface board is equipped with an oscillator frequency of 14746 kHz.
- 4.) Close the *Options dialog* by pressing the *OK* button.
- 5.) Choose the firmware download function by selecting the menu entry *Service -> Firmware download...*
- 6.) The firmware download wizard will be displayed. The wizard tries to identify the type of the attached target. If the detection fails manually select DMC14 for the device ID. Proceed by clicking *OK*.

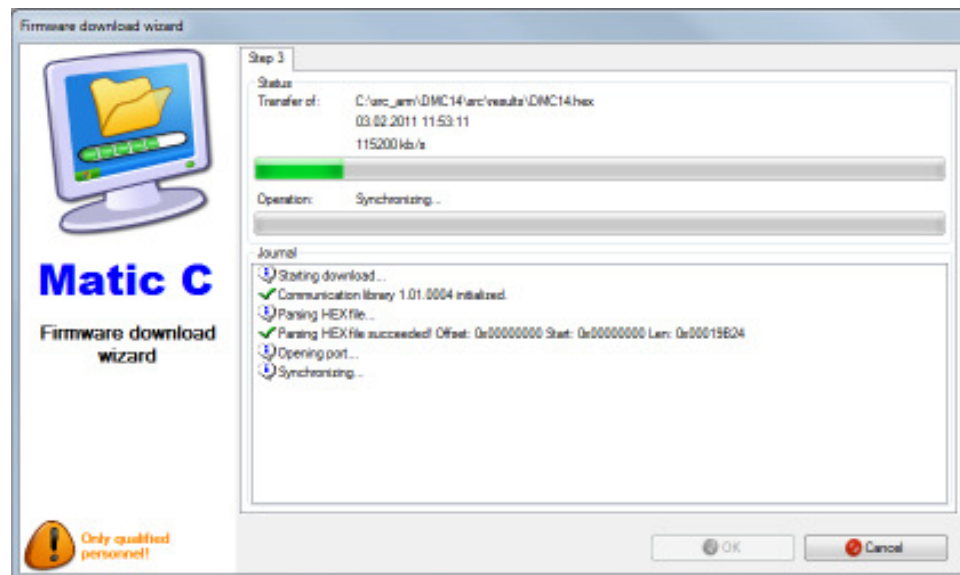




7.) Choose the Hex File containing the binary data for download. A file open dialog can be opened by clicking the button "...".



8.) By clicking the button *Start!* the download will be started.



- 9.) The wizard tries to synchronize with the target first. If this synchronisation fails please check the correct jumper displacement from position J8 to position J9. Press the reset switch at the cable connected to the TEST connector for approx. 1s and release it. Press the retry button.
- 10.) Firmware download starts. The progress will be displayed.
- 11.) When the download is finished this will be displayed.
- 12.) Power off the actuator and remove the connection to the PC.
- 13.) Remove jumper J9 and place it to J8.

## Jumper

Jumper	Meaning	Description
J8	HW-Watchdog Reset out	Reset-Output external watchdog => Reset Input controller
J9	Bootloader Jump	Start bootloader routines
J10	HW-Watchdog Watchdog in	Watchdog trigger output => External watchdog circuit

## Address settings:

HI	LO	ADR	HI	LO	ADR	HI	LO	ADR	HI	LO	ADR
0	0	NA	1	0	16	2	0	32	3	0	48
0	1	NA	1	1	17	2	1	33	3	1	49
0	2	2	1	2	18	2	2	34	3	2	50
0	3	3	1	3	19	2	3	35	3	3	51
0	4	4	1	4	20	2	4	36	3	4	52
0	5	5	1	5	21	2	5	37	3	5	53
0	6	6	1	6	22	2	6	38	3	6	54
0	7	7	1	7	23	2	7	39	3	7	55
0	8	8	1	8	24	2	8	40	3	8	56
0	9	9	1	9	25	2	9	41	3	9	57
0	A	10	1	A	26	2	A	42	3	A	58
0	B	11	1	B	27	2	B	43	3	B	59
0	C	12	1	C	28	2	C	44	3	C	60
0	D	13	1	D	29	2	D	45	3	D	61
0	E	14	1	E	30	2	E	46	3	E	62
0	F	15	1	F	31	2	F	47	3	F	63

HI	LO	ADR	HI	LO	ADR	HI	LO	ADR	HI	LO	ADR
4	0	64	5	0	80	6	0	96	7	0	112
4	1	65	5	1	81	6	1	97	7	1	113
4	2	66	5	2	82	6	2	98	7	2	114
4	3	67	5	3	83	6	3	99	7	3	115
4	4	68	5	4	84	6	4	100	7	4	116
4	5	69	5	5	85	6	5	101	7	5	117
4	6	70	5	6	86	6	6	102	7	6	118
4	7	71	5	7	87	6	7	103	7	7	119
4	8	72	5	8	88	6	8	104	7	8	120
4	9	73	5	9	89	6	9	105	7	9	121
4	A	74	5	A	90	6	A	106	7	A	122
4	B	75	5	B	91	6	B	107	7	B	123
4	C	76	5	C	92	6	C	108	7	C	124
4	D	77	5	D	93	6	D	109	7	D	125
4	E	78	5	E	94	6	E	110	7	E	NA
4	F	79	5	F	95	6	F	111	7	F	NA

NA) This setting is not available, thus invalid.

## DIL Switch S4

Bit	Val	Description
1		<b>Enable Host communication</b>
	0	Host communication disabled. (Only for testing purposes)
	1	Host communication enabled. (Default)
3.2		<b>Reserved</b>
6.4		<b>Fail safe delay time (Added to the watchdog timeout provided by the Profibus Master)</b>
	000	0 Seconds
	001	5 Seconds
	010	10 Seconds
	011	20 Seconds
	100	40 Seconds
	111	Fail safe disabled
7		<b>Fail Safe behaviour on GCC (Global Control Clear)</b>
	0	Fail as is on GCC
	1	Fail safe on GCC
8		<b>Simulate external diagnosis</b>
	0	No simulation of external diagnosis (Default)
	1	Simulation of external diagnosis (Only for testing purposes)

## DIL Switch S6

Bit	Val	Description
1		<b>Address offset of second Profibus channel</b>
	0	No address offset for second channel
	1	Address offset 64 for second channel
1		<b>Line redundancy monitoring (only if S6.4 and S6.5 = 1)</b>
	0	Use fast monitoring/switching mechanism
	1	Switch channel only in case of slave watchdog tripping
3.2		<b>PNO ID selection for emulation mode</b>
	00	Matic C DPV1 (DUAL AS: 0x0C26 / SINGLE AS: 0x0C27)
	01	Matic C DPV0 (0x0686)
	10	AUMA (0x05CD)
	11	SIPOS (DUAL ASIC: 0x056D / SINGLE ASIC: 0x056E)
5.4		<b>Redundancy mode Protocol / Media access</b>
		<b>Dual ASIC</b>
	00	DREHMO redundancy GSD: DREM0C26
	01	System redundancy (0C26)
	10	ABB redundancy (0C26)
	11	Line redundancy (0C27)
		<b>Single ASIC</b>
		No redundancy 1 ASIC GSD: DREM0C27
		No redundancy (0C27)
		No redundancy (0C27)
		Line redundancy (0C27)

6		<b>Redundancy response (Only if S6.4 and S6.5 = 1)</b>
	0	Redundancy reply on active channel
	1	Redundancy reply on both channels
7		<b>Position output Profibus</b>
	0	Output limited to 0..1000 or 46..230
	1	Output with over-/underflow

## LED H16 DIAG

Group	Code	
1 Imp.		<b>System failures</b>
	1	RAM-Test Failure. The internal memory test failed.
	2	Failure test ASIC channel 1
	3	Failure test ASIC channel 2
	4	NV-Memory failure. Failure accessing the non volatile memory.
	5	Hardware data failure. The hardware settings of the board are missing.
2 Imp.		<b>Configuration failures</b>
	1	Host communication disabled. S4.1 = 0
	2	Invalid profibus address
	3	Board not equipped with necessary hardware
	4	Board not equipped with necessary medium voter
3 Imp.		<b>Application failures</b>
	1	Communication to host timed out

## LED H14/H24 Physical state Profibus

HX4	State
Off	Board is not equipped with ASIC for this channel or the ASIC is disabled
1 Pulse	Profibus ASIC is in state Reset
2 Pulses	Profibus ASIC is in state Passive Idle
3 Pulses	Profibus ASIC is in state baud rate detection
On	Profibus ASIC has detected a valid baud rate

## LED H15/H25 Protocol state Profibus

HX5	State
1 Pulse	Profibus ASIC is in state WaitPrm. No SetPrm telegram or a SetPrm with invalid PNO-ID was received.
2 Pulses	Profibus ASIC is in state WaitPrm. A SetPrm telegram with invalid parameters was received.
3 Pulses	Profibus ASIC is in state WaitCfg. No CheckCfg telegram was received.
4 Pulses	Profibus ASIC is in state WaitCfg. A CheckCfg telegram with invalid configuration was received.
5 Pulses	Profibus ASIC is in state GCC. A GCC telegram was received
6 Pulses	General failure in state machine/Illegal state.
On	Profibus ASIC is in state Data Exchange.

# **DREHMO**

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