

## Supplement to Operating Instructions

# MG3 Digital Connection with Process Field Bus

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Order number

\_\_\_\_\_

Serial number

\_\_\_\_\_

Version :1.1 a

<b>Versions</b>		
<b>Version</b>	<b>Date</b>	<b>Reason of Revision</b>
1.0	2004-10	new
1.1	2005-03	Upgrading of functions
1.1a	2005-06	Program parameters added

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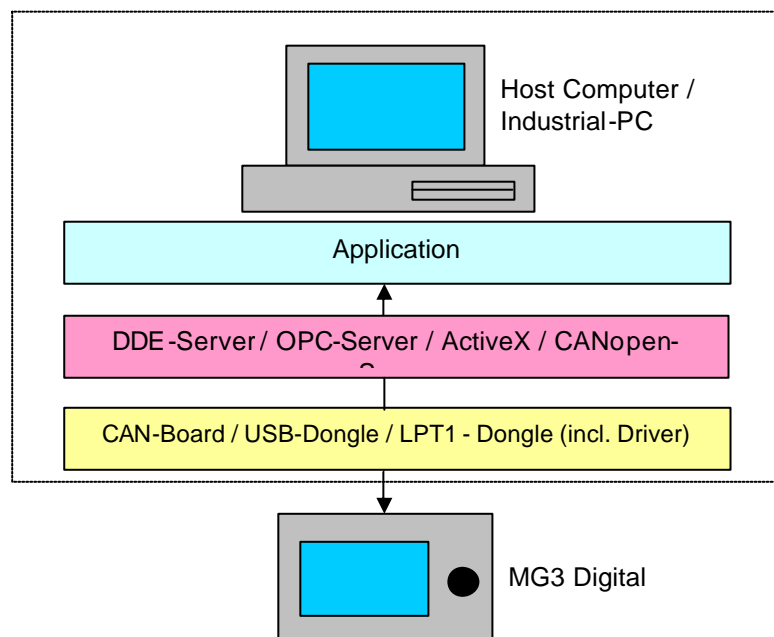
## 1 General

 <b>Information</b>	<p>This supplement contains additional designations for the operation of the MG3D.</p> <p>It is a unit with the operating instructions MG3D.</p>
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The MG3 Digital is able to communicate with a higher-level PLC or PC using CAN-Bus. Therefore the CANopen-protocol is supported as a standard interface. In a CANopen-network the MG3 Digital is operating as a CANopen-slave. See subsequent explanations to get detailed information.

## 2 Possible Bus Topologies

### 2.1 Connection to IPC or host computer



It is possible to connect the MG3 Digital to an application running on an IPC or host computer in several ways as shown in the picture. In many cases the software and hardware tools on the PC-side has to be used from the same manufacturer.

Examples of manufacturers:

PC - Master:

- IXXAT <http://www.ixxat.de/>
- EMS <http://www.ems-wuensche.com/>
- Digitec <http://www.digitec-engineering.de/> (PC104 - Support)
- Synergetic <http://synergetic.com/>

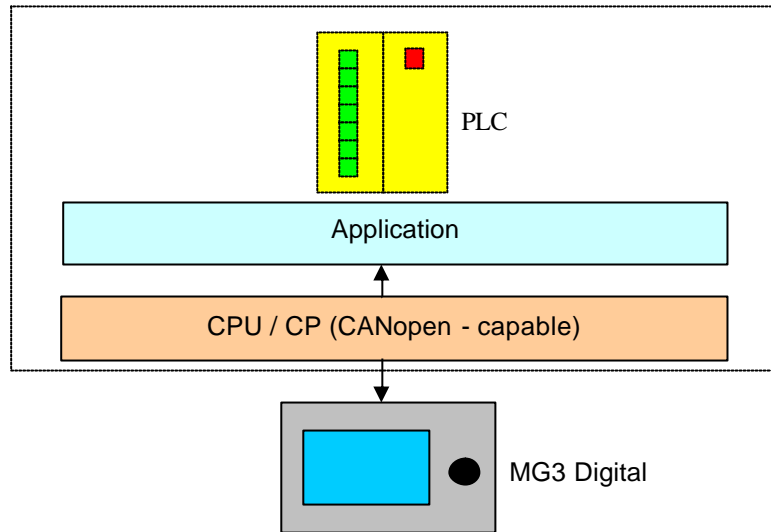
DDE- Server:

- EMS <http://www.ems-wuensche.com/>
- AppliCom <http://www.applicom-int.com/>  
(Wonderware / Allen-Bradley - Support)

OPC- Server:

- Softing <http://www.softing.com/>
- Hilscher <http://www.hilscher.com/>
- IXXAT <http://www.ixxat.de/>
- EMS <http://www.ems-wuensche.com/>
- WoodHead <http://www.woodheadconnectivity.com/>
- Beckhoff <http://www.beckhoff.com/>
- Ferrocontrol <http://www.ferrocontrol.de/>
- Ordinal Technologies <http://www.ordinal.fr/>
- Advanced Production Systems <http://www.igearonline.com/>
- IDX <http://www.idxonline.com/>
- Progea <http://www.progea.com/>
- OPC Foundation <http://www.opcfoundation.org/>
- AppliCom <http://www.applicom-int.com/>

## 2.2 Connection to PLC



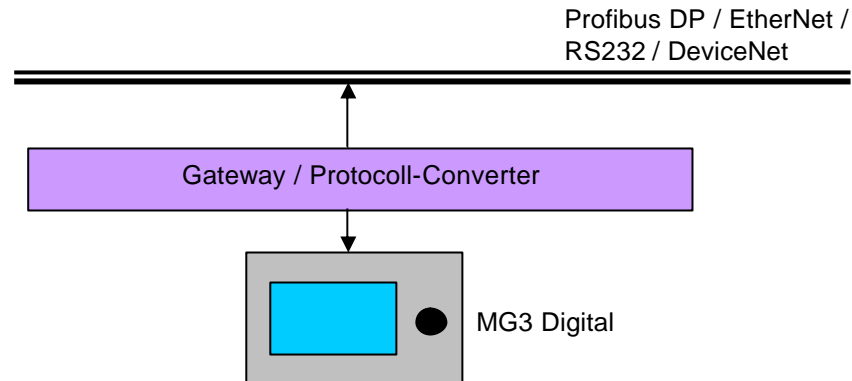
The connection can be established directly to the CPU if the PLC supports this, or otherwise a communication processor module (CP) has to be implemented. If both possibilities are not supported by the manufacturer, it is necessary to proceed like in scheme c). In many cases the connection to CAN-Bus is implemented by hardware and the functionality of CANopen is accessible through function blocks.

Examples of manufacturers:

PLC:

- Helmholtz <http://www.helmholtz.de/> (CANopen-Master-Module for S7-300)
- Speed7 <http://www.speed7.com/> (S7-300 with CANopen-Master-Interface)
- Autronics <http://www.autronix.de/> (SPS with CANopen-Master-Interface)
- Frenzel & Berg <http://www.frenzel-berg.de/> (EASY SPS with CANopen-Master)
- ESD <http://www.esd-electronics.com/> (S5-115U/135U/155U with CAN)
- Inosoft <http://www.inosoft.com/> (SPS with CANopen-Interface)

## 2.3 Connection to another bus system or network



The CANopen-network can be connected to another field-bus or network using a gateway or protocol-converter. Important is, that the gateway works as master on the CANopen-side and as slave on the side of the other bus system. In most cases it is necessary, to perform a separate configuration of the gateway. Some gateways will not support all functions specified in the CANopen standard. There are gateways available with multi-bus-capability.

Examples of manufacturers:

Gateways:

- Port <http://www.port.de/> (Ethernet <-> CANopen)
- Antal <http://www.antal.de/> (Ethernet <-> CANopen)
- Synergetic <http://www.synergetic.com/> (Ethernet <-> CANopen)
- ESD <http://www.esd-electronics.com/>  
(DeviceNet / USB / Bluetooth / EtherNet <-> CANopen)
- Deutschmann <http://www.deutschmann.de/>  
(UNIGATE RS232 / ProfiBus DP <-> CANopen)

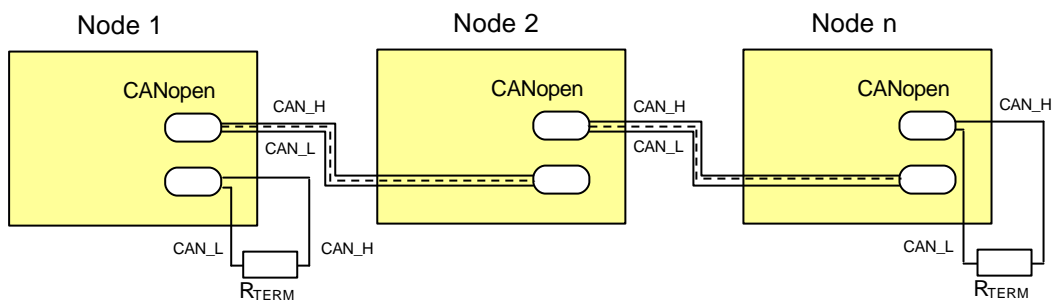
Protocol Converter:

- HMS <http://www.hms-networks.de/>
- Wago <http://www.wago.com/>

### 3 Network Design

The design of the CAN network has to be realized as a line-topology without stubs, which is terminated on both ends by a resistor. For wiring shielded twisted-pair cable is recommended. The maximum length depends on the baud rate and the usage of optical or other transmitters. For more detailed information please refer the CAN- specification ISO 11898-2.

The following scheme illustrates the topology of the CANopen - network.



D-Sub-Assignment (9 Pins):

- Pin 2: CAN\_L
- Pin 3: CAN\_GND
- Pin 5: CAN\_SHIELD
- (optional)
- Pin 6: GND (optional)

Termination Resistor ( $R_{TERM}$ ):

- 124 Ohm  $\leq$  40m Cable Length
- 150..300 Ohm  $>$  40m Cable Length



## 4 Support of Services

### NMT - service:

- CANopen-network management
- emergency-messages

### SDO - transfer:

- transfer of global and program parameters
- reading actual measuring data
- program selection
- reading actual units of measuring data

### PDO - transfer:

- transmission of I/O-image from and to the unit

### Heartbeat or node guarding:

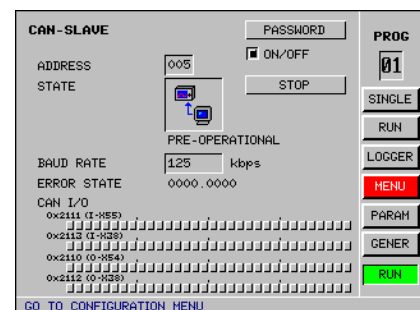
- monitoring of the CANopen-slave by the CANopen-master

Some optional services, like LSS, LMT, dynamic PDO-mapping, dynamic channels, sync-message, time stamp, extended CAL-boot-up and SDO-block transfers are not supported.

## 5 Configuration of Bus-Connection

In the screen "CAN" the setup of the adjustments for CANopen, like slave-ID and baud rate, can be done. Also the actual network state of the unit is indicated.

To change the setting you have to enter the same password like in the screen "PASSWORD" assigned.





### "Disconnected"

There is no connection to the CAN-network. Communication with other participants is not possible. Please check baud rate as well as physical connection to the CAN-network. If the connection is re-installed again, you can get away from this state by pressing the "Reset" - button or by sending from the master.



### "Initialization"

Initialization of the unit. After this state the unit will change automatically to state "Pre-Operational".



### "Pre-Operational"

SDO-transfers are released and local operations are locked. This mode can be used for downloads of recipes.

This state can be activated only by remote control.



### "Operational"

SDO-transfers and PDO-transfers are released. Local operations are locked. This mode is used for normal measuring operation and digital inputs/outputs can be monitored or controlled.

This state can be activated only by remote control.



### "Stop"

SDO-transfers and PDO-transfers are locked. Local operations are released. In this state the setup of the unit can be done as well as local interventions.

This state can be activated manually (local) or by remote control.

Further on in the screen "CAN" are displayed two error words. The left word has to be zero. Otherwise it indicates a hardware problem and you have to contact the manufacturer of the unit.

Please take care when adjusting the slave number. This number has to be unique in the whole network and the unit has to get connected to the network afterwards only.

If you don't use the CANopen-functions please switch off the button "On/Off". Otherwise the unit will try to establish communication to the network.

## 6 Device Profile, Data- and Communication Parameters

The MG3 Digital operates as a CANopen-slave and it supports the generic device profile DS301, version 4.0. The supplied EDS-file (electronic data sheet) provides a description of the object dictionary as well as of the PDO-mapping. The default settings of the predefined-connection-set are used for defining the CAN-identifiers. It's not possible to manipulate the identifiers through the bus.

For read or write operations to and from the object dictionary the transfer modes "expedited" and "segmented" are supported. The general section of the object dictionary provides information about the data types and the structure of records which are used by application objects. User-defined data structures are supporting index 255, so it is possible to read-back the whole structure of the object dictionary. Also communication parameters are readable and partially adjustable. In case of a communication-blackout caused by wrong parameters, the instruction "reset parameters" must be executed and so the original state will be re-established.

### 6.1 Data Type Related Parameters

Index	Subidx	Description	Access	Map	DataType
0x0000		-	-	-	-
0x0001		BOOL	ro		UINT32
0x0002		INT8	ro		UINT32
0x0003		INT16	ro		UINT32
0x0004		INT32	ro		UINT32
0x0005		UINT8	ro		UINT32
0x0006		UINT16	ro		UINT32
0x0007		UNIT32	ro		UINT32
0x0008		REAL	ro		UINT32
0x0009		V_STR	ro		UINT32
0x0020		PDO_COMM_PAR	-	-	ARRAY
	0	0x05 (Number of Entries)	ro		UINT8
	1	0x07 (UINT32 )	ro		UINT8
	2	0x05 (UINT8)	ro		UINT8
	3	0x06 (UINT16)	ro		UINT8
	4	0x05 (UINT8)	ro		UINT8
	5	0x06 (UINT16)	ro		UINT8
0x0021		PDO_MAPPING	-	-	ARRAY
	0	0x40 (Number of mapped Objects in PDO)	ro		UINT8
	1..64	0x07 (UINT32)	ro		UINT8
0x0022		SDO_PARAM	-	-	ARRAY
	0	0x03 (Number of Entries)	ro		UINT8
	1	0x07 (UINT32 )	ro		UINT8
	2	0x07 (UINT32 )	ro		UINT8
	3	0x05 (UINT8)	ro		UINT8

0x0023		IDENT	-	-	ARRAY
	0	0x04 (Number of Entries)	ro		UINT8
	1	0x07 (UINT32 )	ro		UINT8
	2	0x07 (UINT32 )	ro		UINT8
	3	0x07 (UINT32 )	ro		UINT8
	4	0x07 (UINT32 )	ro		UINT8
0x0040		PARAM_PROG	-	-	ARRAY
	0	Number of Entries (NoE)	ro		UINT8
	1...NoE	Data Type	ro		UINT8
0x0041		PARAM_GLOB	-	-	ARRAY
	0	Number of Entries (NoE)	ro		UINT8
	1...NoE	Data Type	ro		UINT8
0x0042		VAL_ACT	-	-	ARRAY
	0	Number of Entries (NoE)	ro		UINT8
	1...NoE	Data Type	ro		UINT8
0x0043		VAL_UNIT	-	-	ARRAY
	0	Number of Entries (NoE)	ro		UINT8
	1...NoE	Data Type	ro		UINT8

## 6.2 Communication Parameters

Index	Subidx	Description	Access	Map	DataType
0x1000		Device Type	ro		UINT32
0x1001		Error Register	ro		UINT8
0x1002		Status Register	ro		UINT32
0x1003		Error FIFO	-	-	ARRAY
	0	Number of Errors (to reset overwrite with 0)	rw		UINT8
	1...NoE	Error 01 ... Error NoE (newest at pos. 1)	ro		UINT32
0x1005		COB_ID SYNC-Message	ro		UINT32
0x1006		Synchronisation Interval	ro		UINT32
0x1007		Synchronisation Window Length	ro		UINT32
0x1008		Device Name	ro		V_STR
0x1009		Hardware-Version	ro		V_STR
0x100A		Software-Version	ro		V_STR
0x100C		Guard-Time in msec	rw		UINT16
0x100D		Life-Time-Factor	rw		UINT8
0x100E		COB_ID NMT-EC	ro		UINT32
0x1010		Store Parameters	-	-	ARRAY
	0	Number of Entries	ro		UINT8
	1	Save all Parameters	rw		UINT32
	2	Save Comm. Parameters	rw		UINT32
	3	Save App. Parameters	rw		UINT32
	4	Save Manuf. Parameters	rw		UINT32
0x1011		Restore Default Parameters	-	-	ARRAY
	0	Number of Entries	ro		UINT8
	1	Restore all Parameters	rw		UINT32
	2	Restore Comm. Parameters	rw		UINT32
	3	Restore App. Parameters	rw		UINT32
	4	Restore Manuf. Parameters	rw		UINT32
0x1012		COB_ID TIME_STAMP	ro		UINT32
0x1013		High Resolution Time Stamp	ro		UINT32
0x1014		COB_ID EMCY	ro		UINT32
0x1015		Inhibit-Time EMCY in 100µsec	rw		UINT32
0x1016		Consumer Heartbeat in msec	-	-	ARRAY
	0	Number of Entries	ro		UINT8
	1	Node-ID:Heartbeat-Time in msec	rw		UINT32
	2...127	Node-ID:Heartbeat-Time in msec	rw		UINT32
0x1017		Producer Heartbeat-Time in msec	rw		UINT16

Index	Subidx	Description	Access	Map	Data Type
0x1018		Identity Object	-	-	DEFSTRUCT
	0	Number of Entries	ro		UINT8
	1	Vendor ID	ro		UINT32
	2	Product Code	ro		UINT32
	3	Serial Number	ro		UINT32
0x1200		Default-SDO	-	-	DEFSTRUCT
	0	Number of Entries	ro		UINT8
	1	COB-ID Rx (Client => Server)	ro		UINT32
	2	COB-ID Tx (Server => Client)	ro		UINT32
0x1400		PDO 1 Rx Parameter	-	-	DEFSTRUCT
	0	Number of Entries	ro		UINT8
	1	COB-ID	ro		UINT32
	2	Transmit Type (manufacturer-specific triggered)	ro		UINT8
	3	Inhibit-Time in msec	rw		UINT16
0x1600		PDO 1 Rx Mapping	-	-	ARRAY
	0	Number of Mapped Objects in Structure	ro		UINT8
	1	Index:Subindex: Length in Bits	rw		UINT32
	2 (..64)	Index:Subindex: Length in Bits	rw		UINT32
0x1800		PDO 1 Tx	-	-	STRUCT
	0	Number of Entries	ro		UINT8
	1	COB-ID	ro		UINT32
	2	Transmit Type (manufacturer-specific triggered)	ro		UINT8
	3	Inhibit-Time in msec	rw		UINT16
0x1A00		PDO 1 Tx Mapping	-	-	ARRAY
	0	Number of Mapped Objects in Structure	ro		UINT8
	1	Index:Subindex:Länge in Bit	rw		UINT32
	2 (..64)	Index:Subindex:Länge in Bit	rw		UINT32

## 7

### Parameter Setup and Remote Selection

Starting with index 2000h remote access to global and program parameters is possible. Very important for parametrizing the unit is index 20FFh (parametrizing mode). After writing a parameter in mode "monitor", the actual parameter set will be saved immediately. So after a re-boot of the unit the written parameters will hold their values. The mode "monitor" can be used to change subset parameters in measuring mode (state "operational").

For remote selection of a new measuring program the index 2004h has to be written. In menu "general" the program selection must be set to internal!



#### Info

When switching the unit from state "stop" to state "pre-operational" or "operational", parameters could have been changed by local operation. Therefore all parameters should read-back or written at this change of state.

### 7.1 Global and Program Parameters

Index	Subidx	Description	Access	Map	Data Type
0x2000		Program Parameter Channel 1	-	-	RECORD
	0	Number of Parameters	ro		UINT8
	1	RangeCurrent (0 - 2kA, 1 - 5kA, 2 - 20kA, 3 - 100kA, 4 - 500kA)	rw		UINT8
	2	RangeVoltage (0 - 0.5V, 1 - 2.5V, 2 - 10V, 3 - 50V)	rw		UINT8
	3	ProfileCurrent (0 - Point, 1 - Seam)	rw		UINT8
	4	TypeCurrent (0 - AC, 1 - DC)	rw		UINT8
	5	DistanceMeasuring (0 - off, 1 - on)	rw		UINT8
	6	EnableS1 (0 - off, 1 - on)	rw		UINT8
	7	EnableS2 (0 - off, 1 - on)	rw		UINT8
	8	EnableS3 (0 - off, 1 - on)	rw		UINT8
	9	SignalSector (0 - off, 1 - on)	rw		UINT8
	10	MonitoringQuantity1 (1: 0 - aus, 1 - lpk, 2 - Upk, 3 - P, 4 - R, 10 - Irms, 11 - Q, 12 - Urms, 13 - Ut, 14 - W, 15 - tw, 16 - tw-)	rw		UINT8
	11	MonitoringQuantity2 (2: 0 - aus, 1 - lpk, 2 - Upk, 3 - P, 4 - R, 10 - Irms, 11 - Q, 12 - Urms, 13 - Ut, 14 - W, 15 - tw, 16 - tw-)	rw		UINT8
	12	EnableEnvelope1 (0 - off, 1 - on)	rw		UINT8
	13	EnableEnvelope2 (0 - off, 1 - on)	rw		UINT8
	14	EnablePressure (0 - off, 1 - on)	rw		UINT8
	15	EnableForce (0 - off, 1 - on)	rw		UINT8
	16	CoolDownTime (0...999)	rw		UINT16
	17	MeasuringTime (1...2000)	rw		UINT16
	18	DelayTime (1...2000)	rw		UINT16
	19	SectorSignalMin (1...2000)	rw		UINT16
	20	SectorSignalMax (1...2000)	rw		UINT16
	21	SetValueS2 (-32768...32767)	rw		INT32
	22	MinLimitS1 (-32768...32767)	rw		INT32
	23	MaxLimitS1 (-32768...32767)	rw		INT32
	24	MinLimitS3 (-32768...32767)	rw		INT32
	25	MaxLimitS3 (-32768...32767)	rw		INT32
	26	UpperLimitQuantity1	rw		REAL
	27	LowerLimitQuantity1	rw		REAL
	28	UpperWarningQuantity1	rw		REAL
	29	LowerWarningQuantity1	rw		REAL
	30	UpperLimitQuantity2	rw		REAL
	31	LowerLimitQuantity2	rw		REAL
	32	UpperWarningQuantity2	rw		REAL
	33	LowerWarningQuantity2	rw		REAL
	34	MaxLimitForce	rw		REAL
	35	MinLimitForce	rw		REAL
	36	MaxLimitPressure	rw		REAL
	37	MinLimitPressure	rw		REAL
	38	TriggerLevel (0...99%)	rw		REAL
	39	CurrentFallLevel (0...99%)	rw		REAL
	255	Object Information	ro		UINT32

Index	Subidx	Description	Access	Map	Data Type
0x2001		Program Parameter Channel 2	-	-	RECORD
	0	Number of Parameters	ro		UINT8
	1	RangeCurrent (0 - 2kA, 1 - 5kA, 2 - 20kA, 3 - 100kA, 4 - 500kA)	rw		UINT8
	2	RangeVoltage (0 - 0.5V, 1 - 2.5V, 2 - 10V, 3 - 50V)	rw		UINT8
	3	ProfileCurrent (0 - Point, 1 - Seam)	rw		UINT8
	4	TypeCurrent (0 - AC, 1 - DC)	rw		UINT8
	5	DistanceMeasuring (0 - off, 1 - on)	rw		UINT8
	6	EnableS4 (0 - off, 1 - on)	rw		UINT8
	7	EnableS5 (0 - off, 1 - on)	rw		UINT8
	8	EnableS6 (0 - off, 1 - on)	rw		UINT8
	9	SignalSector (0 - off, 1 - on)	rw		UINT8
	10	MonitoringQuantity1 (1: 0 - aus, 1 - lpk, 2 - Upk, 3 - P, 4 - R, 10 - Irms, 11 - Q, 12 - Urms, 13 - Ut, 14 - W, 15 - tw, 16 - tw-)	rw		UINT8
	11	MonitoringQuantity2 (2: 0 - aus, 1 - lpk, 2 - Upk, 3 - P, 4 - R, 10 - Irms, 11 - Q, 12 - Urms, 13 - Ut, 14 - W, 15 - tw, 16 - tw-)	rw		UINT8
	12	EnableEnvelope1 (0 - off, 1 - on)	rw		UINT8
	13	EnableEnvelope2 (0 - off, 1 - on)	rw		UINT8
	14	EnablePressure (0 - off, 1 - on)	rw		UINT8
	15	EnableForce (0 - off, 1 - on)	rw		UINT8
	16	CoolDownTime (0...999)	rw		UINT16
	17	MeasuringTime (1...2000)	rw		UINT16
	18	DelayTime (1...2000)	rw		UINT16
	19	SectorSignalMin (1...2000)	rw		UINT16
	20	SectorSignalMax (1...2000)	rw		UINT16
	21	SetValueS5 (-32768...32767)	rw		INT32
	22	MinLimitS4 (-32768...32767)	rw		INT32
	23	MaxLimitS4 (-32768...32767)	rw		INT32
	24	MinLimitS6 (-32768...32767)	rw		INT32
	25	MaxLimitS6 (-32768...32767)	rw		INT32
	26	UpperLimitQuantity1	rw		REAL
	27	LowerLimitQuantity1	rw		REAL
	28	UpperWarningQuantity1	rw		REAL
	29	LowerWarningQuantity1	rw		REAL
	30	UpperLimitQuantity2	rw		REAL
	31	LowerLimitQuantity2	rw		REAL
	32	UpperWarningQuantity2	rw		REAL
	33	LowerWarningQuantity2	rw		REAL
	34	MaxLimitForce	rw		REAL
	35	MinLimitForce	rw		REAL
	36	MaxLimitPressure	rw		REAL
	37	MinLimitPressure	rw		REAL
	38	TriggerLevel (0...99%)	rw		REAL
	39	CurrentFallLevel (0...99%)	rw		REAL
	255	Object Information	ro		UINT32

Index	Subidx	Description	Access	Map	Data Type
0x2002		Global Parameter Channel 1	-	-	RECORD
	0	Number of Elements	ro		UINT8
	1	CounterMode (Count Direction: 0 +, 1 -, 2 off)	rw		UINT8
	2	TriggerSource (Triggerquelle: 0 - I, 1 - external, 2 - F/p)	rw		UINT8
	3	TypeCoil (0..x1, 1..x10)	rw		UINT8
	4	MeasuringMode (0 - Coil, 1 - Shunt)	rw		UINT8
	5	PartRecogMode (0 - absolute, 1 - relative)	rw		UINT8
	6	DisplacementMode (0 - absolute, 1 - relative)	rw		UINT8
	7	EnableDataLogging (0 - off, 1 - on)	rw		UINT8
	8	LogFileNumber	rw		INT32
	9	ActualValueCounter	rw		UINT32
	10	UpperLimitCounterUp	rw		UINT32
	11	UpperWarningCounterUp	rw		UINT32
	12	StartValueCounterDown	rw		UINT32
	13	LowerWarningCounterDown	rw		UINT32
	14	CutFrequencyFilterUI	ro		REAL
	15	ResolutionPressure	ro		REAL
	16	OffsetPressure	ro		REAL
	17	ResolutionForce	ro		REAL
	18	OffsetForce	ro		REAL
	255	Object Information	ro		UINT32
0x2003		Global Parameter Channel 2	-	-	RECORD
	0	Number of Elements	ro		UINT8
	1	CounterMode (Count Direction: 0 +, 1 -, 2 off)	rw		UINT8
	2	TriggerSource (Triggerquelle: 0 - I, 1 - external, 2 - F/p)	rw		UINT8
	3	TypeCoil (0..x1, 1..x10)	rw		UINT8
	4	MeasuringMode (0 - Coil, 1 - Shunt)	rw		UINT8
	5	PartRecogMode (0 - absolute, 1 - relative)	rw		UINT8
	6	DisplacementMode (0 - absolute, 1 - relative)	rw		UINT8
	7	EnableDataLogging (0 - off, 1 - on)	rw		UINT8
	8	LogFileNumber	rw		INT32
	9	ActualValueCounter	rw		UINT32
	10	UpperLimitCounterUp	rw		UINT32
	11	UpperWarningCounterUp	rw		UINT32
	12	StartValueCounterDown	rw		UINT32
	13	LowerWarningCounterDown	rw		UINT32
	14	CutFrequencyFilterUI	ro		REAL
	15	ResolutionPressure	ro		REAL
	16	OffsetPressure	ro		REAL
	17	ResolutionForce	ro		REAL
	18	OffsetForce	ro		REAL
	255	Object Information	ro		UINT32
0x2004		Program Number	rw		UINT16
0x20FF		Parametrizing Mode (0 - Monitor, 1 - Recipe)	rw		UINT8

Parameters are based on following units: Current (kA), Voltage (V), Power (kW), Resistance ( $\mu\Omega$ ), Energy (Wsec), Charge (Asec), Voltage Integral (Vsec), Time (msec/DC or cyc/AC), Pressure (bar), Force (N), Resolution Pressure (bar/V), Resolution Force (N/V).



## 8 Download Of Recipes

To accelerate the download of complete recipes (program or complete parameterizing set), index 20FFh has to be switched to mode "recipe". In this mode all written parameters will not be saved immediately, but only buffered temporary. In this mode all parameters are write-only, what means they are prevented from reading back. After re-activating the mode "monitor", the complete parameter set will be saved. Please note that the SDO-timeout period has to be adjusted sufficient (> 1 sec).

The download of complete parameter sets should be realized as follows:

- activate recipe mode
- adjust program number to 1
- write global parameters
- write program parameters of program 1
- activate monitor mode
- wait for SDO - acknowledge
  
- activate recipe mode
- adjust program number to 2
- write program parameters of program 2
- activate monitor mode
- wait for SDO - acknowledge
  
- ...
  
- activate recipe mode
- adjust program number to 99
- write program parameters of program 99
- activate monitor mode
- wait for SDO - acknowledge
- re-adjust program number

If mode "recipe" is active, on the CAN-screen a blue "R" will appear right from the state icon.

## 9 Reading Actual Measuring Values

Through index 2100h and 2101h the actual measuring values for the measured channel could read after a finished measurement. A finished measurement is ascertainable by any change of the digital bus-output "measurement toggle bit" (index 2112h). Index 210Fh contains the corresponding unit for the measuring quantity.

Index	Subidx	Description	Access	Map	Data Type
0x2100		Values Channel 1	-		RECORD
	0	Number of Elements (20)	ro		UINT8
	1	Counter	ro		UINT32
	2	Peak Current-Ipk	ro		REAL
	3	Peak Voltage-Upk	ro		REAL
	4	Power-P	ro		REAL
	5	Resistance-R	ro		REAL
	6	Part Recognition-S1	ro		REAL
	7	Switch Off Distance-S2	ro		REAL
	8	Displacement-S3	ro		REAL
	9	Force-F	ro		REAL
	10	Pressure-PRS	ro		REAL
	11	Effective Current-Irms	ro		REAL
	12	Charge-Q	ro		REAL
	13	Effective Voltage-Urms	ro		REAL
	14	Voltage Integral-Ut	ro		REAL
	15	Energy-W	ro		REAL
	16	Weld Time-tw	ro		REAL
	17	Weld Time Periods-tw~	ro		REAL
	18	Current Time-ti	ro		REAL
	19	Current Angle-β	ro		REAL
	20	Program (program number of last measurement)	ro		INT32
	255	Object Information	ro		UINT32
0x2101		Values Channel 2	-		RECORD
	0	Number of Elements (20)	ro		UINT8
	1	Counter	ro		UINT32
	2	Peak Current-Ipk	ro		REAL
	3	Peak Voltage-Upk	ro		REAL
	4	Power-P	ro		REAL
	5	Resistance-R	ro		REAL
	6	Part Recognition-S4	ro		REAL
	7	Switch Off Distance-S5	ro		REAL
	8	Displacement-S6	ro		REAL
	9	Force-F	ro		REAL
	10	Pressure-PRS	ro		REAL
	11	Effective Current-Irms	ro		REAL
	12	Charge-Q	ro		REAL
	13	Effective Voltage-Urms	ro		REAL
	14	Voltage Integral-Ut	ro		REAL
	15	Energy-W	ro		REAL
	16	Weld Time-tw	ro		REAL
	17	Weld Time Periods-tw~	ro		REAL
	18	Current Time-ti	ro		REAL
	19	Current Angle-β	ro		REAL
	20	Program (program number of last measurement)	ro		INT32
	255	Object Information	ro		UINT32

Index	Subidx	Description	Access	Map	Data Type
0x210F		Units actual Values	-	-	RECORD
	0	Number of Elements (19)	ro		UINT8
	1	Counter	ro		V_STR
	2	Peak Current	ro		V_STR
	3	Peak Voltage	ro		V_STR
	4	Power	ro		V_STR
	5	Resistance	ro		V_STR
	6	Part Recognition	ro		V_STR
	7	Switch Off Distance	ro		V_STR
	8	Displacement	ro		V_STR
	9	Force	ro		V_STR
	10	Pressure	ro		V_STR
	11	Effective Current	ro		V_STR
	12	Charge	ro		V_STR
	13	Effective Voltage	ro		V_STR
	14	Voltage Integral	ro		V_STR
	15	Energy	ro		V_STR
	16	Weld Time	ro		V_STR
	17	Weld Time Periods	ro		V_STR
	18	Current Time	ro		V_STR
	19	Current Angle	ro		V_STR
	255	Object Information	ro		UINT32

## 10 Digital In- /Outputs by CAN or Hardware

Index 2110h to 2113h contains the I/O-image of the unit, which is transferred through the bus. The in-/outputs are mapped into the default PDO. The image of the digital outputs is transferred in the state "operational" at any change of the output-image or after a maximum time period is expired. Accordingly the digital inputs should be transferred at least at any change to guarantee synchronous I/O - images between master and slave.

Index	Subidx	Description	Pin	PDO	Access	Map	Data Type
0x2110		Binary Outputs	X54		ro	x	UINT32
		Bit 00 - Ready Ch 1/2	01	1.0.0			
		Bit 01 - Current Ch 1	02	1.0.1			
		Bit 02 - Warning min. Ch 1/2	03	1.0.2			
		Bit 03 - Warning max. Ch 1/2	04	1.0.3			
		Bit 04 - Limit min. Ch 1/2	05	1.0.4			
		Bit 05 - Counter Limit Ch 1/2	06	1.0.5			
		Bit 06 - Reject Ch 2	07	1.0.6			
		Bit 07 - Current Ch 2	08	1.0.7			
		Bit 13 - Good Ch 1	14	1.1.5			
		Bit 14 - Reject Ch 1	15	1.1.6			
		Bit 15 - Overflow Ch 1/2	16	1.1.7			
		Bit 16 - 0-Current Ch 1	17	1.2.0			
		Bit 17 - Limit max. Ch 1/2	18	1.2.1			
		Bit 18 - Counter Warn. Ch 1/2	19	1.2.2			
		Bit 19 - Good Ch 2	20	1.2.3			
		Bit 20 - 0-Current Ch 2	21	1.2.4			
		Bit 31 - Always "1"	-	1.3.7			

Index	Subidx	Description	Pin	PDO	Access	Map	Data Type
0x2111		Binary Inputs	X55		wo	x	UINT32
		Bit 04 - Clear Good - O's, Set Bad O's Ch 1/2	05	1.0.4			
		Bit 07 - Save Logging Ch 1	08	1.0.7			
		Bit 08 - Counter Reset Ch 1	09	1.1.0			
		Bit 09 - Measurement Reset Ch 2	10	1.1.1			
		Bit 11 - Hold Ch 1	12	1.1.3			
		Bit 12 - Trigger Enable Ch 1	13	1.1.4			
		Bit 16 - Not Ready Extern Ch 1/2	17	1.2.0			
		Bit 17 - Set Good - O's, Clear Bad O's Ch 1/2	18	1.2.1			
		Bit 20 - Save Logging Ch 2	21	1.2.4			
		Bit 21 - Counter Reset Ch 2	22	1.2.5			
		Bit 22 - Measurement Reset Ch 1	23	1.2.6			
		Bit 23 - Hold Ch 2	24	1.2.7			
		Bit 24 - Trigger Enable Ch 2	25	1.3.0			
0x2112		Binary Extended Outputs	X38		ro	x	UINT32
		Bit 02 - Displacement min. Ch 1	03	1.4.2			
		Bit 03 - Displacement max. Ch 1	04	1.4.3			
		Bit 04 - Displacement min. Ch 2	05	1.4.4			
		Bit 05 - Displacement max. Ch 2	06	1.4.5			
		Bit 08 - Displacement good Ch 2	09	1.5.0			
		Bit 09 - Displacement good Ch 1	10	1.5.1			
		Bit 10 - Pressure / Force bad Ch 1	11	1.5.2			
		Bit 11 - Pressure / Force good Ch 1	12	1.5.3			
		Bit 12 - Pressure / Force bad Ch 2	13	1.5.4			
		Bit 13 - Pressure / Force good Ch 2	14	1.5.5			
		Bit 18 - Measurement Toggle Bit Ch 1	-	1.6.2			
		Bit 21 - Measurement Toggle Bit Ch 2	-	1.6.5			
		Bit 24 - Part Recognition Low-Active Ch 1	25	1.7.0			
		Bit 25 - Part Recognition Low-Active Ch 2	26	1.7.1			
		Bit 26 - Part Recognition min. Ch 1	27	1.7.2			
		Bit 27 - Part Recognition max. Ch 1	28	1.7.3			
	Bit 28 - Part Recognition min. Ch 2	29	1.7.4				
	Bit 29 - Part Recognition max. Ch 2	30	1.7.5				
	Bit 31 - Always "1"	-	1.7.7				
0x2113		Binary Extended Inputs	X38		wo	x	UINT32
		Bit 06 - Reference (Homing Mode) Ch 1/2	39	1.4.6			

Because of the inevitable bus latency times not all digital I/Os are available through the bus. The following I/Os are realized conventionally by wiring:

#### Binary Extended Outputs (X38):

- O 15 - Current Stop Low Active Ch 1
- O 16 - Current Stop High Active Ch 2
- O 19 - Current Stop Low Active Ch 1
- O 30 - Current Stop High Active Ch 2

#### Binary Extended Inputs (X38):

- I 44 - 0-Displacement Ch 2
- I 45 - 0-Displacement Ch 1
- I 46 - Part Evaluation Ch 2
- I 47 - Part Evaluation Ch 1
- I 48 - Start Measurement Ch 2
- I 49 - Start Measurement Ch 1

Consequently when using the CAN-bus the connectors X54, X55, X56 and X57 can be leaved out. But it is also possible, to wire that I/Os further on. In that case the input signal will be a logical OR - disjunction of hardware inputs and bus signals.

You can monitor the I/O image, which is transferred through CANopen, in the screen "CAN". Further on by pressing the knob/pushbutton it is possible to force the bus inputs.

PDO messages for corresponding I/Os (Binary Outputs / Binary Inputs) have a bit pattern like in the following scheme (cmp. Table PDO.BYTE.BIT):

0x2110 / 0x2111				0x2112 / 0x2113			
07	00	15	08	23	16	31	24
BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7



Info

When measuring channel 1 and 2 parallel, the scheme "Flow Chart Parts Detection and Current Measurement Parallel" within the manual MG3 Digital is mandatory. With the digital input "Start part recognition" the temporal release for the corresponding channel can be forced also when distance measuring is disabled. Remote selection of the program number takes effect only after the completion of a measurement (channel 1 / 2).

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