DCS800

Software Application:	**Supply for Electric Lifting Magnets (mains fed and battery fed)**
Title:	**DEABBMagBat**
Version:	**V03.1**
DCS800 (20 to 5200 A)	

DCS800 Drive Manuals

		Language									
	Public. number	E	D	I	ES	F	CN	RU	PL	PT	SE
DCS800 Quick Guide	3ADW000191	x	x	x	x	x				x	x
DCS800 Tools & Documentation CD	3ADW000211	x									
DCS800 Converter module											
Flyer DCS800	3ADW000190	x	x		x	x				x	
Technical Catalog DCS800	3ADW000192	x	x	x	x	x	x	x	x	x	
Hardware Manual DCS800	3ADW000194	x	x	x	x	x	x	x	x		
Hardware Manual DCS800 update DCF503B/DCF504B	3ADW000194Z	x									
Firmware Manual DCS800	3ADW000193	x	x	p	x	x	x	x	x		
Installation according to EMC	3ADW000032	x									
Technical Guide	3ADW000163	x									
Service Manual DCS800	3ADW000195	x	x								
12-Pulse Manual	3ADW000196	x									
CMA-2 Board	3ADW000136	x									
Flyer Hard - Parallel	3ADW000213	x									
Drive Tools											
DriveWindow 2.x - User's Manual	3BFE64560981	x									
DriveOPC 2.x - User's Manual	3BFE00073846	x									
Optical DDCS Communication Link	3AFE63988235	x									
DDCS Branching Units - User’s Manual	3BFE64285513	x									
DCS800 Applications											
PLC Programming with C_____s	C_____s_V23	x	x			x					
61131 DCS800 target +tool description - Application Program	3ADW000199	x									
DCS800 Crane Drive											
DCS800 Crane Drive Manual suppl.	3AST004143	x									
DCS800 Crane Drive Product note	PDC5 EN	x									
DCS800 Winder ITC											
DCS800 Winder Product note	PDC2 EN	x									
DCS800 Winder description ITC	3ADW000308	x									
Winder Questionnaire	3ADW000253Z	x									
DCS800-E Panel Solution											
Flyer DCS800-E Panel solution	3ADW000210	x									
Hardware Manual DCS800-E	3ADW000224	x									
DCS800-A Enclosed Converters											
Flyer DCS800-A	3ADW000213	x									
Technical Catalog DCS800-A	3ADW000198	x									
Installation of DCS800-A	3ADW000091	x	x								
DCS800-R Rebuild System											
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DCS800-R Optical Rebuild Kits	3ADW000415	x									
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Extension Modules											
RAIO-01 Analog IO Extension	3AFE64484567	x									
RDIO-01 Digital IO Extension	3AFE64485733	x									
RRIA-01 Resolver Interface Module	3AFE68570760	x									
RTAC-01 Pulse Encoder Interface	3AFE64486853	x									
RTAC-03 TTL Pulse Encoder Interface	3AFE68650500	x									
AIMA R-slot extension	3AFE64661442	x									
Door mounting kits											
Door mounting DCS Control Panel (IP54, click in)	3AUA0000076085	x									
Door mounting DCS Control Panel (fix mounting)	3AFE68294673	x									
Door mounting DCS Control Panel (IP66, fix mounting)	3AFE68829593	x									
Serial Communication											
Drive specific serial communication											
NETA Remote diagnostic interface	3AFE64605062	x									
Fieldbus Adapter with DC Drives RPBA- (PROFIBUS)	3AFE64504215	x									
Fieldbus Adapter with DC Drives RCAN-02 (CANopen)											
Fieldbus Adapter with DC Drives RCNA-01 (ControlNet)	3AFE64506005	x									
Fieldbus Adapter with DC Drives RDNA- (DeviceNet)	3AFE64504223	x									
Fieldbus Adapter with DC Drives RMBA (MODBUS)	3AFE64498851	x									
Fieldbus Adapter with DC Drives RETA (Ethernet)	3AFE64539736	x									
x -> existing p -> planned											
Status 01.2015											

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Electric Lifting Magnets

General

Industrial electric lifting magnets (mains fed and battery fed) are used in electric and electromechanical devices and equipment with a magnetic field generated by an electrical current creating sufficient force for lifting, holding and handling loads with ferromagnetic properties.

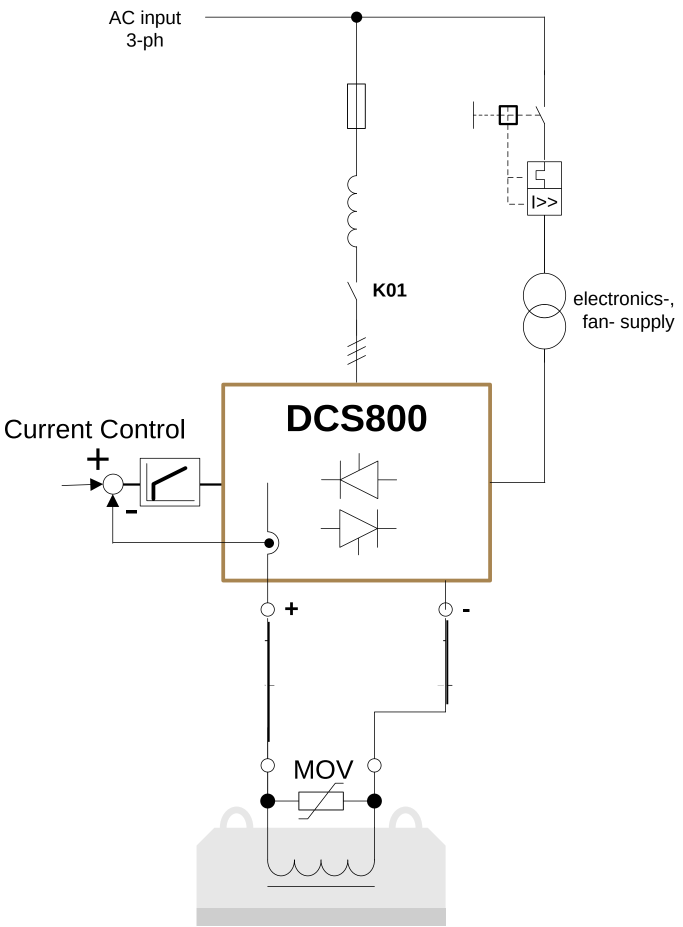
They are also used as magnetic separation equipment, used to separate magnetic from nonmagnetic material, for example separating ferrous metal from other material in scrap.

Mains-fed electric lifting magnets shall provide a tear-off force corresponding to at least 2 times the working load under the conditions specified by the customer.
A stand-by battery shall be provided to supply power in case the mains supply fails. It shall be capable of providing the current needed to hold the working load limit for at least 10 minutes.

A protection concept always needs to be provided (please refer to Appendix D). Different solutions are possible. The protection concept always depends on the application.

Diagram 1: Single Magnet in Current Control Mode

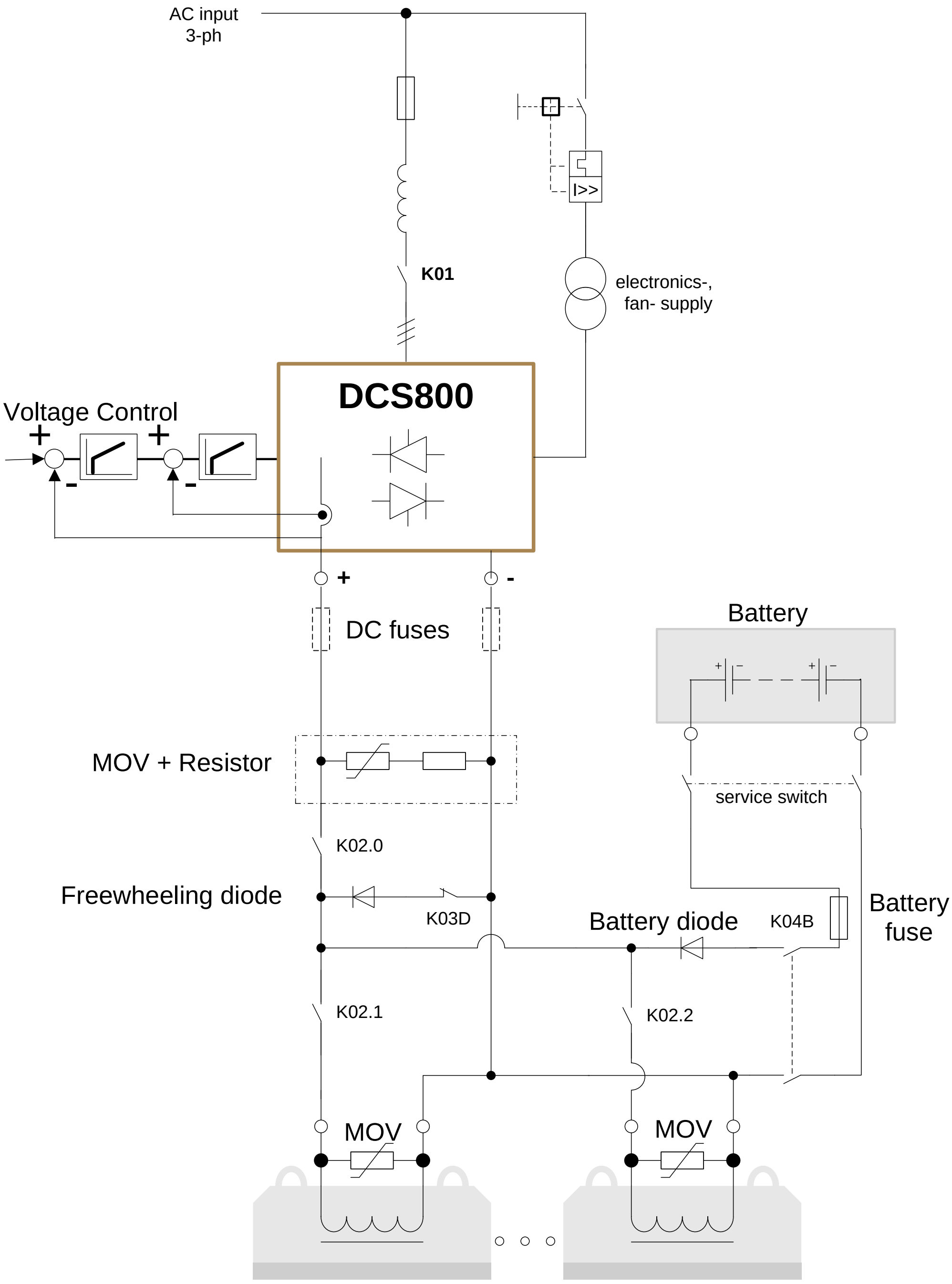
The following figure shows one magnet and a MOV directly in parallel of the magnet for overvoltage protection. The converter operates in current control.



For safety reasons a battery back-up is necessary, if the load must not fall down in case of mains supply problems.

Diagram 2: Multi Magnets in Voltage Control Mode and Battery Backup

The following figure shows 2 magnets in parallel with MOVs directly in parallel of each magnet and an additional MOV+resistor combination plus a freewheeling diode in parallel of both magnets for overvoltage protection. The converter operates in voltage control.



DC fuses	Protection of battery, if thyristors are broken.

Note DC fuses

DC fuses will open a short circuit with the battery in case of two blown thyristors in the DCS800 to avoid the loss of magnet supply by battery backup.

Safety instructions

Chapter overview

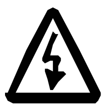
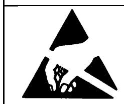
This chapter contains the safety instructions which you must follow when installing, operating and servicing the DCS800. If ignored, physical injury or death may follow, or damage may occur to the DCS800 or the DCS800 equipment. Read the safety instructions before you work on the unit.

To which products this chapter applies

This chapter applies to the DCS800... Size D1 to D7 and field exciter units DCF80x.

Use of warnings and notes

There are two types of safety instructions throughout this manual: warnings and notes. Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. Notes draw attention to a particular condition or fact, or give information on a subject. The warning symbols are used as follows:

	Dangerous voltage warning warns of high voltage which can cause physical injury and/or damage to the equipment.
	General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.
	Electrostatic discharge warning warns of electrostatic discharge which can damage the equipment.

Installation and maintenance work

These warnings are intended for all who work on the DCS800, magnet supply cable or magnet. Ignoring the instructions can cause physical injury or death.

Only qualified electricians are allowed to install and maintain the DCS800.

- Never work on the DCS800, magnet cable or magnet when main power is applied.
  Always ensure by measuring with a multi meter (impedance at least 1 MΩ) that:

  1. Voltage between DCS800 input phases U1, V1 and W1 and the frame is close to 0 V.
  2. Voltage between terminals C+ and D- and the frame is close to 0 V.
- Do not work on the control cables when power is applied to the DCS800 or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the DCS800 even when the main power on the DCS800 is switched off.
- Do not make any insulation or voltage withstand tests on the DCS800 or DCS800 modules.
- When reconnecting the magnet cable, always check that the C+ and D- cables are connected with the proper terminal.

Note:

- The magnet cable terminals on the DCS800 are at a dangerously high voltage when the input power is on, regardless of whether the magnet is running or not.
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the terminals of relay outputs SDCS-IOB-2 and RDIO.
- DCS800 with enclosure extension: Before working on the DCS800, isolate the whole DCS800 from the supply.

WARNING! The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily.

Use grounding strip:

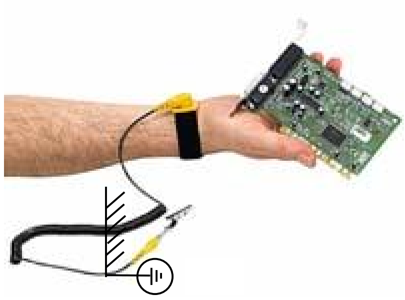


ABB order no.: 3ADV050035P0001

Grounding

These instructions are intended for all who are responsible for the grounding of the DCS800. Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic interference

- Ground the DCS800, magnet and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and pick-up.
- Make sure that grounding conductors are adequately sized as required by safety regulations.
- In a multiple-DCS800 installation, connect each DCS800 separately to protective earth (PE) ⏚.
- Minimize EMC emission and make a 360° high frequency grounding of screened cable entries at the cabinet lead-through.
- Do not install a DCS800 with EMC filter on an ungrounded power system or a high resistance-grounded (over 30 ohms) power system.

Note:

- Power cable shields are suitable for equipment grounding conductors only when adequately sized to meet safety regulations.
- As the normal leakage current of the DCS800 is higher than 3.5 mA AC or 10 mA DC (stated by EN 50178, 5.2.11.1), a fixed protective earth connection is required.

Fiber optic cables

WARNING! Handle the fiber optic cables with care. When unplugging optic cables, always grab the connector, not the cable itself. Do not touch the ends of the fibers with bare hands as the fiber is extremely sensitive to dirt. The minimum allowed bend radius is 35 mm (1.4 in.).

Mechanical installation

These notes are intended for all who install the DCS800. Handle the unit carefully to avoid damage and injury.

- DCS800 sizes D4...D7: The DCS800 is heavy. Do not lift it alone. Do not lift the unit by the front cover. Place units D4 and D5 only on its back.

  DCS800 sizes D5...D7: The DCS800 is heavy. Lift the DCS800 by the lifting lugs only. Do not tilt the unit. The unit will overturn from a tilt of about 6 degrees.
- Make sure that dust from drilling does not enter the DCS800 when installing. Electrically conductive dust inside the unit may cause damage or lead to malfunction.
- Ensure sufficient cooling.
- Do not fasten the DCS800 by riveting or welding.

Operation

These warnings are intended for all who plan the operation of the DCS800 or operate the DCS800. Ignoring the instructions can cause physical injury or death or damage the equipment.

- Before adjusting the DCS800 and putting it into service, make sure that the magnet and all DCS800 equipment are suitable for operation throughout the voltage range provided by the DCS800. The DCS800 can be adjusted to operate the magnet at voltages above and below the rated voltage.
- Do not activate automatic fault reset functions of the Standard Application Program if dangerous situations can occur. When activated, these functions will reset the DCS800 and resume operation after a fault.
- Do not control the magnet supply with the disconnecting device (disconnecting mains); instead, use the control panel keys and , or commands via the I/O board of the DCS800.

- Mains connection
  You can use a disconnect switch (with fuses) in the power supply of the thyristor power converter to disconnect the electrical components of the unit from the power supply for installation and maintenance work. The type of disconnect used must be a disconnect switch as per EN 60947-3, Class B, so as to comply with EU regulations, or a circuit-breaker type which switches off the load circuit by means of an auxiliary contact causing the breaker's main contacts to open. The mains disconnect must be locked in its "OPEN" position during any installation and maintenance work.
- EMERGENCY STOP buttons must be installed at each control desk and at all other control panels requiring an emergency stop function. Pressing the STOP button on the control panel of the thyristor power converter will neither cause an emergency magnet supply stop, nor will the DCS800 be disconnected from any dangerous potential.
  To avoid unintentional operating states, or to shut the unit down in case of any imminent danger according to the standards in the safety instructions it is not sufficient to merely shut down the DCS800 via signals "RUN", "DCS800 OFF" or "Emergency Stop" respectively "control panel" or "PC tool".
- Intended use
  The operating instructions cannot take into consideration every possible case of configuration, operation or maintenance. Thus, they mainly give such advice only, which is required by qualified personnel for normal operation of the machines and devices in industrial installations.

  If in special cases the electrical machines and devices are intended for use in non-industrial installations - which may require stricter safety regulations (e.g. protection against contact by children or similar) -, these additional safety measures for the installation must be provided by the customer during assembly.

Note:

- When the control location is not set to Local (L not shown in the status row of the display), the stop key on the control panel will not stop the DCS800. To stop the DCS800 using the control panel, press the LOC/REM key and then the stop key .

Introduction to this manual

Chapter overview

This chapter describes the purpose, contents and the intended use of this manual.

Before You Start

The purpose of this manual is to provide the information necessary to handle the magnet control.

Study carefully the *Safety instructions* at the beginning of this manual before attempting any work on or with the DCS800. Read through this manual before starting-up the DCS800. The installation and commissioning instructions given in the *DCS800 Hardware Manual, DCS800 Firmware Manual* and *DCS800 Quick Guide* must also be read before proceeding.

This manual is based on the **standard** DCS800 firmware Version 3.80 or later.

What this manual contains

Electric Lifting Magnets - General information.

The *Safety instructions* can be found at the beginning of this manual.

Introduction to this manual, the chapter you are currently reading, introduces you to this manual.

DCS800 Solution for Electric Lifting Magnets this chapter describes the functionality functions, commissioning of the MultiFex configuration.

Appendix A – Used Standard DCS800 Parameters

Appendix B – Application Parameters

Appendix C – Overvoltage Protection Hints

Appendix D – Additional Technical Information

DCS800 Solution for Electric Lifting Magnets

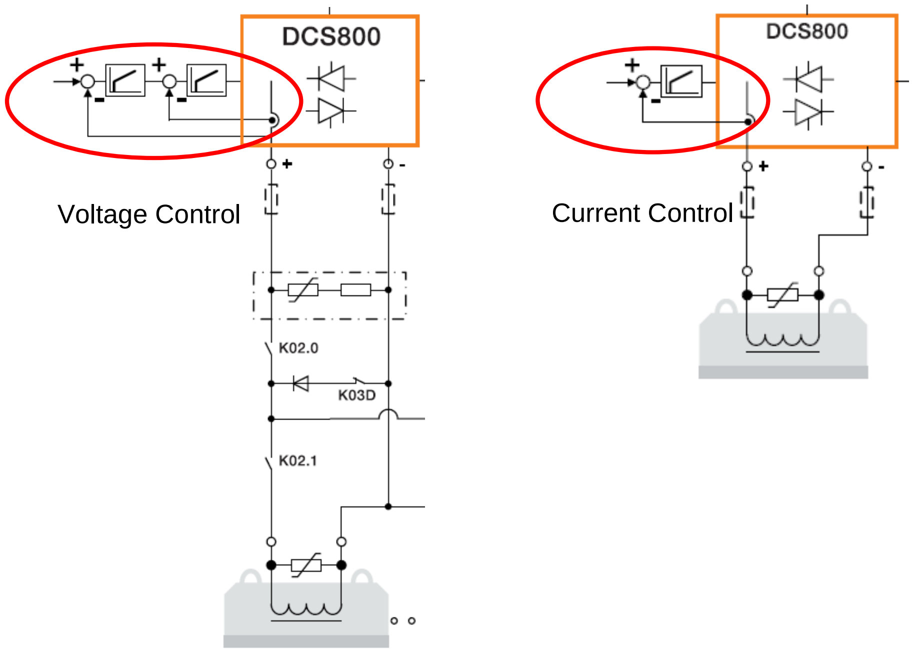
Chapter overview

This chapter describes the functions and commissioning of the electric lifting magnets configuration.

The basic firmware contains:	1.) Magnetization mode (Voltage and current control) 2.) Demagnetization modes (Voltage and current control) 3.) Voltage and current set points 4.) Magnet resistor monitoring 5.) Step by step sheet release 6.) Display: DCS800 current output DCS800 voltage output 7.) Transport Mode 8.) Magnet I^2t-Function (for up to 8 Magnets)
Not included:	- Charging and Discharging of a battery (extra hardware required)

Functional description

Magnetization and Demagnetization Mode:



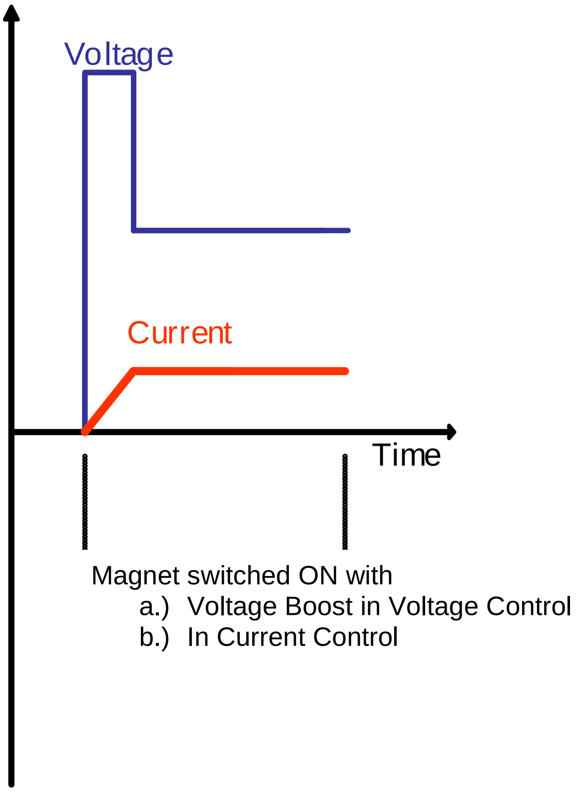
Magnetic force can be dynamically increased and decreased using pure current control using the full voltage range. But a longer pure current control can overheat the magnet. Magnets in parallel prefer voltage control. This will prevent possible overloading of the individual magnet. Depending on the requirements, a combination of current and voltage control is desirable.

The commands *Cmd_MagOn*, *Cmd_Run*, *Cmd_Cur* and *Cmd_Demag* can be set via digital input or Magnet Control Word (**7.10**) and customized by **parameter group 65**:
- *ConfMagOn* (**65.01** / Magnet On)
- *ConfEnbRun* (**65.02 /** Enable Run)
- *ConfEnbCC* (**65.04** / Current Control Selection)
- *ConfDeMag* (**65.05** / Demagnetizing Selection)

If AutoRunSel = Enabled (**60.12**) then **Enable RUN** is activated by **Magnet ON** command.

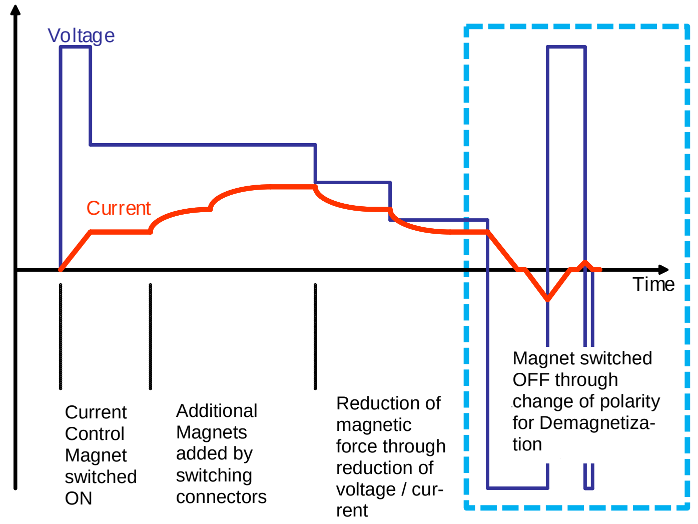
If RESEToverSTOP = Enabled (**60.13**) then **RESET** is initiated by a **STOP** command.

Switch On Boost:

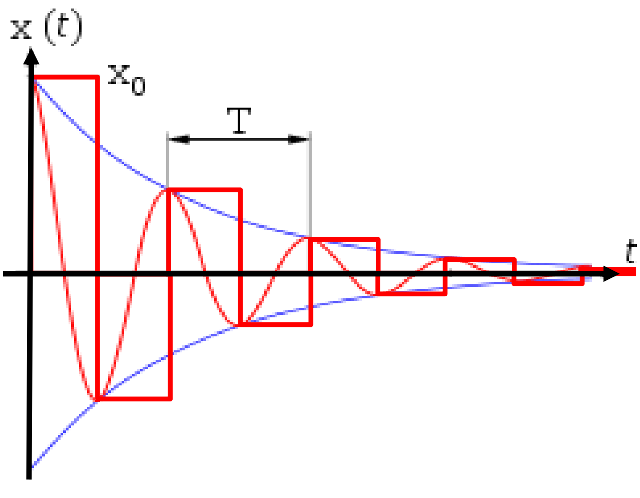


The diagram above shows how the magnet current reference can be reached as quickly as possible after start command of the converter. Voltage or current control can be used.
In current control the magnet current can be ramped up dynamically dependent on the amount of input voltage.
The higher the input voltage the higher is the dynamic of the current controller.
In voltage control the magnet current can be ramped up dependent on a voltage boost.
The voltage boost is a voltage reference value which is higher than the demanded voltage reference to be able to ramp up the magnet current dynamically.
After reaching the magnet current reference the voltage reference is switched to the demanded voltage reference.
The voltage boost can be at a maximum of the AC input voltage * 1.35.
Precautions have to be taken not to supply the converter with a higher input voltage than the specified isolation voltage of the magnet.

Demagnetization or Degaussing Mode (Selection in parameter 60.15):



The operation mode of **Demagnetization** is shown on the diagram above.
The release of light weight loads is done by demagnetization.
Decreasing or alternating (positive and negative) magnet current will erase the residual force. A 4-quadrant converter which can supply current in both directions is required for this operation.



There are requirements of erasing the remanence of magnets completely.
The operation mode which is called **Degaussing by pulsing** is shown in the diagram above. Decreasing and alternating the magnet current will erase the residual force.
The pulse width (T/2) of each current pulse in parameter **60.17** as well as the complete degaussing time Ƭ in parameter **60.16** has to be set up to define the number of alternating current pulses and the amplitude. The reversal time delay for the change of the thyristor bridge has also to be considered. The degaussing procedure in simplified terms can be shown with a damped harmonic oscillation curve.

Voltage and current set points:

The **voltage reference source** can be configured in ConfRefSrc (**63.17**)

63.17 = **Analog_Inp**:

- Analog input with 0 – 10 Volt, 0 – 20 mA or 4 – 20 mA (configured by jumpers on SDCS-CON-4). The voltage (**11.03** = AI1…AI6) can be monitored in **group 5** and adjusted in **group 13**. The scaling 0 to 100% is related from 0 to **99.02** in voltage and from 0 …**99.03** in current control.

63.17 = **PB_cont** (Push buttons continuously):

- The function *Push buttons continuously* operates like the MotPot function in the standard firmware and is dedicated for voltage references only.
  The commands *Push Button **Up***, Push Button **Down** and *Push Button **Reset*** can be set via digital input or Magnet Control Word (**7.10**) and customized by **parameter group 65**:
  - *ConfPB_UP* (**65.10** / Push Button **Up** Reference)
  - *ConfPB_DOWN* (**65.11** / Push Button **Down** Reference)
  - *ConfPB_Reset* (**65.12** / Push Button **Reset** Reference)

If PBRESEToverSTOP = Enabled (**60.14**) then **PB-RESET** is initiated by a **STOP** command.

While the reference **Up** button is pressed, the reference will be increased continuously depending on PB_RefRamp (**63.18**).
While the reference **Down** button is pressed, the reference will be decreased continuously depending on PB_RefRamp (**63.18**).

The unit of Parameter **63.18** is “% per second”.
63.18 = 1 %/s means that the Ref value is ramped down from 100% to 0% within 100 seconds.
63.18 = 10 %/s means that the Ref value is ramped down from 100% to 0% within 10 seconds.
63.18 = 100 %/s means that the Ref value is ramped down from 100% to 0% within 1 second.

While the **PB_Reset** button is pressed, the reference value is set to PB_ResetRef (**63.20**) or zero.
It is possible to freeze the actual reference value on power off in PB_ActValFreeze (**63.21**).
It is also possible to select with PB_RefPowerOn (**63.22**) whether the reference value after power on is the last frozen value PB_ActValFreeze (**63.21**), an internal fixed set point PB_ResetRef (**63.20**) or zero.

PB_RefMax (**63.24**) will limit the increasing function to a maximum value and PB_RefMin (**63.23**) will limit the decreasing function to a minimum value.

63.17 = **PB_step** (Push buttons stepwise):

- The function *Push buttons stepwise* operates with a step range and is dedicated for voltage references only.
  The commands *Push Button **Up***, Push Button **Down** and *Push Button **Reset*** can be set via digital input or Magnet Control Word (**7.10**) and customized by **parameter group 65**:

  - *ConfPB_UP* (**65.10** / Push Button **Up** Reference)
  - *ConfPB_DOWN* (**65.11** / Push Button **Down** Reference)
  - *ConfPB_Reset* (**65.12** / Push Button **Reset** Reference)

If PBRESETvoverSTOP = Enabled (**60.14**) then **PB-RESET** is initiated by a **STOP** command.

While the reference **Up** button is pressed, the reference will be increased incrementally with the rising edge depending on a variable step range PB_RefStep (**63.19**).
While the reference **Down** button is pressed, the reference will be decreased incrementally with the rising edge depending on a variable step range PB_RefStep (**63.19**).
While the **PB_Reset** button is pressed, the reference value is set to PB_ResetRef (**63.20**) or zero.
It is possible to freeze the actual reference value on power off in PB_ActValFreeze (**63.21**). It is also possible to select with PB_RefPowerOn (**63.22**) whether the reference value after power on is the last frozen value PB_ActValFreeze (**63.21**), an internal fixed set point PB_ResetRef (**63.20**) or zero.

PB_RefMax (**63.24**) will limit the increasing function to a maximum value and PB_RefMin (**63.23**) will limit the decreasing function to a minimum value.

<u>63.17 = **Int_Ref** (Internal voltage reference values)</u>

- There are 16 *internal voltage reference values* available which can be selected via 4 Bits (BCD). These fixed values are dedicated for voltage references only.

The reference value can be indexed by a table of the fixed values named IntRef01 – IntRef16 (**63.01** – **63.16**) via 4 Bits (BCD).
The resulting internal reference is written to parameter **23.01**.

The commands *IntRefBit0*, *IntRefBit1*, *IntRefBit2* and *IntRefBit3* can be set via digital input or Magnet Control Word (**7.10**) and customized by **parameter group 65**:
- *ConfRefBit0* (**65.06 /** Internal Reference Bit 0)
- *ConfRefBit1* (**65.07 /** Internal Reference Bit 1)
- *ConfRefBit2* (**65.08 /** Internal Reference Bit 2)
- *ConfRefBit3* (**65.09 /** Internal Reference Bit 3)

- Table of selectable internal references:

Bit 3	Bit 2	Bit 1	Bit 0	Fixed Set Point
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	5
0	1	0	1	6
0	1	1	0	7
0	1	1	1	8
1	0	0	0	9
1	0	0	1	10
1	0	1	0	11
1	0	1	1	12
1	1	0	0	13
1	1	0	1	14
1	1	1	0	15
1	1	1	1	16

The **current reference source** can be configured directly in parameter *TorqRefA Sel* (**25.10** = AI1…AI6) and **doesn't depend** on the configuration of **63.17.**
Analog input with 0 – 10 Volt, 0 – 20 mA or 4 – 20 mA (configured by jumpers on SDCS-CON-4).

Step by step sheet release (Unload cranes sheet by sheet):
If the function button **StepbyStepRelease** is pressed the following procedure starts:

1.) DCS800 is in voltage control or current control when the function button is pressed.

2.) The actual current value is set as reference current value (IRef1) for internal use.

3.) In voltage control the control mode is switched over to current control.

4.) The current reference is ramped down within UnloadRampStep (**60.05**) and is always limited with StepIrefMin (**60.10**).

NOTE: The unit of Parameters **60.05** and **60.11** is "% per second":
1 %/s means that IRef is ramped down from 100% to 0% within 100 seconds.
10 %/s means that IRef is ramped down from 100% to 0% within 10 seconds.
100 %/s means that IRef is ramped down from 100% to 0% within 1 second.

5.) Release the function button:
With the release of the function button the application proceeds with taking the actual current reference (IrefRamp) and starts to ramp it up within BackRamp Step (**60.11**) to increase the magnet current reference up to a secure value and to avoid further sheets being released: IRef2 = IrefRamp + IOffset (Parameter **60.04**).

I.) If HoldTimeSel = Enabled (**60.08)** then for HoldTimeDelay (**60.09**) 2 different procedures are possible:
a) tHold elapses, the current reference is ramped up from IRef2 to IRef1 within BackRampStep (**60.11**) and the sheet release routine will be left. If voltage control was the selected control mode then this mode will be selected again.
b) the function button is pressed again before tHold has elapsed and the application routine proceeds with releasing sheet 2. This procedure is repeatable until the last sheet has been released and StepIrefMin (**60.10**) has not been reached.

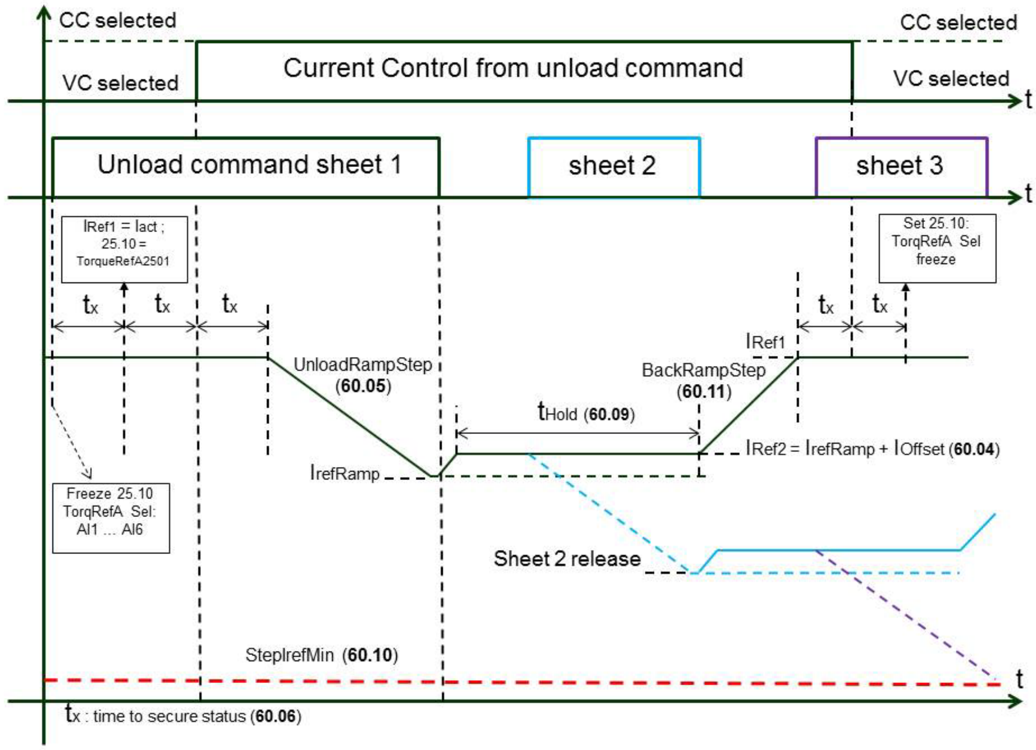
Releasing the function button always results in entering the decision to be taken within HoldTimeDelay (**60.09**) for procedure I.) a) or I.) b).

II.) If required the hold time delay procedure in I.) a) can be disabled with HoldTimeSel (**60.08** = Disabled) and the step by step sheet release mode can only be left with a STOP command (RdyRef = FALSE). If the function button is pressed again the application routine proceeds with releasing sheet 2. This procedure is repeatable until the last sheet has been released and StepIrefMin (**60.10**) has not been reached.

To ensure reliable transition of certain steps in the program routine a secure state delay time tx (**60.06**) can be set.

The command *StepbyStepRel* can be set via digital input or Magnet Control Word (**7.10**) and customized by **parameter group 65**:
- *ConfStbyStRel* (**65.13** / Step by Step Release)

The following figure shows the procedure of the step by step sheet release mode:



<u>**Transport Mode** (set voltage reference to the rated magnet voltage)</u>

The command *TransportMode* can be set via digital input or Magnet Control Word (**7.10**) and customized by **parameter group 65**:

- ConfgTranspMode (**65.14** / Transport Mode)

TransportMode ON: Voltage control / reference value is fixed to the rated magnet voltage**

TransportMode OFF: Output voltage is variable and the reference value depends on the configuration set up.

The Transport Mode command has the highest priority and therefore overrides every other command in the application.

This reference value is selected via **7.03 Bit 10 (DirectSpeedRef) by the magnet software application and can be monitored in parameter **23.15**.

Monitoring:

Display converter current and voltage output

Current actual value can be assigned to an analog output (0 – 10 Volt) in **group 15**.
Voltage actual value can be assigned to an analog output (0 – 10 Volt) in **group 15**.

Magnet resistance monitoring:

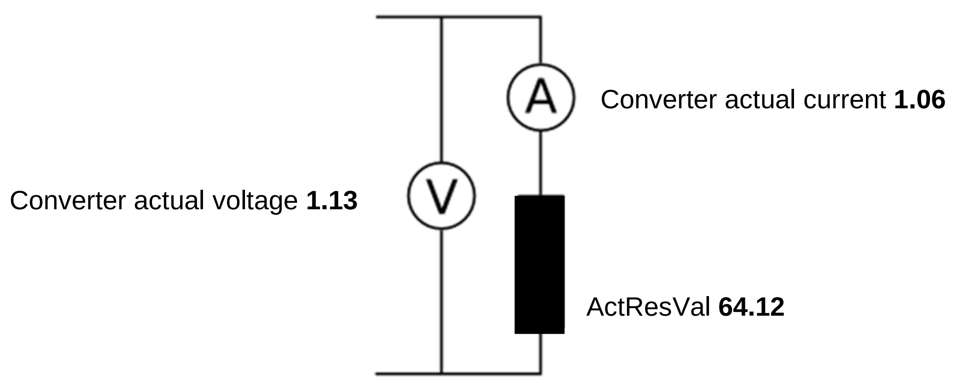
The magnet resistance value can be monitored. Inside a defined window separate alarms can be enabled for an upper and a lower threshold. The alarms can be shown in the control panel or configured for use on digital outputs.
The filtered values of voltage and current are used to calculate the magnets resistance:

The actual resistance value ActResVal (**64.12**) = UA / IA

MagResMonitor (**64.06** = **Enabled)** activates the alarms while the magnet resistance monitoring is permanently working with the converter in **RdyRef** (08.01 Bit 2 = TRUE) state.

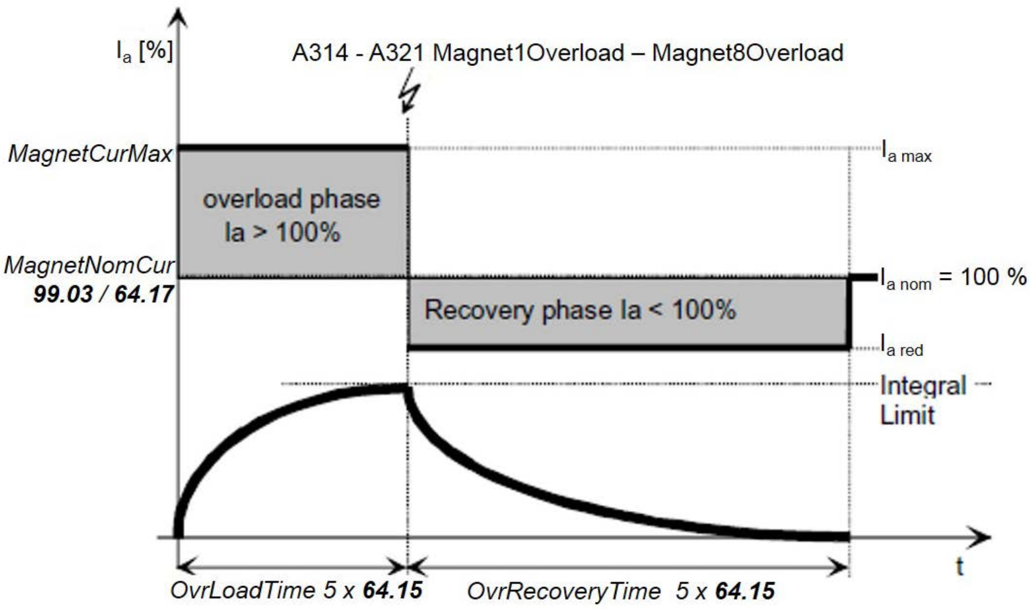
IF 8.01 Bit 2 = FALSE then the actual resistor value showed in ActResVal (**64.12**) = 0.

A compare function with parameter **64.08** for the Resistance Limit Down (cold resistance – tolerance in mΩ) and parameter **64.07** for the Resistance Limit Up (warm resistance + tolerance in mΩ) is implemented as well as a hysteresis function (parameter **64.09** in mΩ) for debouncing. There are 2 parameters available for assigning the warning signals (alarm events: **A312** “AlarmResHot“ and parameter **64.11 = ON** or **A313** “AlarmResCold“ and parameter **64.10 = ON**) to digital outputs in **group 14**.



Magnet I²t-Function

The overload capacity of the magnet will be calculated as square of the current and the time in seconds.
I²t is used to calculate heat generation in the magnet to protect it from thermal damage or failures in case of excess heat generation.

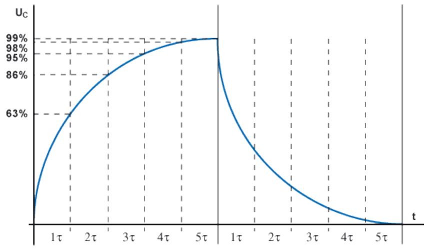


Up to 8 magnets can be monitored with I²t accumulators:
OvrlMag1Accu (**64.21**)
OvrlMag2Accu (**64.22**)
OvrlMag3Accu (**64.23**)
OvrlMag4Accu (**64.24**)
OvrlMag5Accu (**64.25**)
OvrlMag6Accu (**64.26**)
OvrlMag7Accu (**64.27**)
OvrlMag8Accu (**64.28**)

The amount of installed and used magnets in the applications has to be configured in NumberOfMagnets (**64.17**).

The commands *Magnet1act, Magnet2act, Magnet3act, Magnet4act, Magnet5act, Magnet6act, Magnet7act* and *Magnet8act* can be selected via digital inputs or Magnet Control Word (**7.10**) and customized by **parameter group 65**:
- *ConfMonMagnet1* (**65.17** / Magnet 1 active)
- *ConfMonMagnet2* (**65.18** / Magnet 2 active)
- *ConfMonMagnet3* (**65.19** / Magnet 3 active)
- *ConfMonMagnet4* (**65.20** / Magnet 4 active)
- *ConfMonMagnet5* (**65.21** / Magnet 5 active)
- *ConfMonMagnet6* (**65.22** / Magnet 6 active)
- *ConfMonMagnet7* (**65.23** / Magnet 7 active)
- *ConfMonMagnet8* (**65.24** / Magnet 8 active)

The thermal time constant τ [s] of the magnets can be configured in ThermTime-Const (**64.15**). Based on that thermal time constant τ the calculation over an exponential charging/discharging curve can be realized.



The square of the actual overall magnet current (**1.06**) is multiplied with the sample time of the software task and divided by the number of active magnets to calculate the individual actual overload value in each relevant I^2t accumulator. The overload values of magnet 1 to 8 are shown in OvrlMag1Accu (**64.21**) - OvrlMag8Accu (**64.28**). The NumberOfMagnets (**64.17**) helps to divide the actual overall magnet current (**1.06**) into the appropriate current of each selected magnet. The input signals **Magnet 1 active - Magnet 8 active** furthermore help to distinguish whether an installed magnet is leading the appropriate part of the current or not.

With MagOvrlSetLev (**64.13**) the level for overload alarm events **A314** – **A321** "**Magnet1Overload – Magnet8Overload**" and with MagOvrlResLev (**64.14**) the reset level for the overload warning events can be configured.

Active overload warning events are also monitored in MagnetSW_Ovrl (**64.16**) with
Bit0 → Magnet1Ovrld
Bit1 → Magnet2Ovrld
Bit2 → Magnet3Ovrld
Bit3 → Magnet4Ovrld
Bit4 → Magnet5Ovrld
Bit5 → Magnet6Ovrld
Bit6 → Magnet7Ovrld
Bit7 → Magnet8Ovrld

Commissioning and engineering instructions
Start Up

1.) If necessary, set all parameters to default by means of ApplMacro (**99.08**) = **Factory** and ApplRestore (**99.07**) = **Yes**. Check with MacroSel (**8.10**).
2.) Enter the magnet data, the mains (supply) data and the most important protections [ArmOvrVoltLev (**30.08**), [ArmOvrCurLev (**30.09**), Language (**99.01**), Magnet Nominal Voltage (M1NomVolt / **99.02**), Magnet Nominal Current (M1NomCur / **99.03**), M1BaseSpeed (**99.04** = 99.02), NomMainsVolt (**99.10**) and M1UsedFesxType (**99.12** = NotUsed)].

Autotuning of the Current Controller

1.) Set parameter 43.01 = **FieldConv** to activate the converter like a field exciter for autotuning.
2.) Start the **Autotuning of the field current controller** by means of ServiceMode (**99.06**) = **FieldCurAuto** and set **On** command within 20 s.
3.) During the autotuning the main contactor will be closed, the load circuit is measured by means of increasing the magnet current to the nominal current (**99.03**) and the current control parameters are set.
4.) If the autotuning fails **A121 AutotuneFail** is set. For more details please refer to the DCS800 manual, check Diagnosis (**9.11**) and repeat the autotuning.
5.) Set parameter 43.01 = **ArmConv** (Armature Converter) again.
6.) Set reversal delay 43.14 = 50 ms, zero current time out 97.19 = 200 ms and the firing limit mode 43.13 = Fix in 4Q operation.

Voltage Controller Set Up

1.) **Voltage controller**
The voltage controller setting is sufficient for almost all applications. In case of the DCS800 the speed controller is used as voltage controller.
24.03 = 1.0 preset application value
24.09 = 200ms preset application value
It is nonetheless advisable to check the setting of the voltage controller and optimize it if necessary. Please keep in mind that a time-limited switchover to current control is speeding up the current change and that the filter time UdcFilt (**64.02**) will affect the controlling.

2.) **Controlling with a low voltage**
If the voltage controller is required to be able to control currents smaller than 1 A, then a base-load resistor should be connected at the DC output of the DCS800. This is damping the voltage peaks caused by the current chopping. But nonetheless, there is no alternative to reduce the gain of the voltage controller in this current range.
24.04 = 0.1 preset application value
24.05 = 10% preset application value

Application Set Up

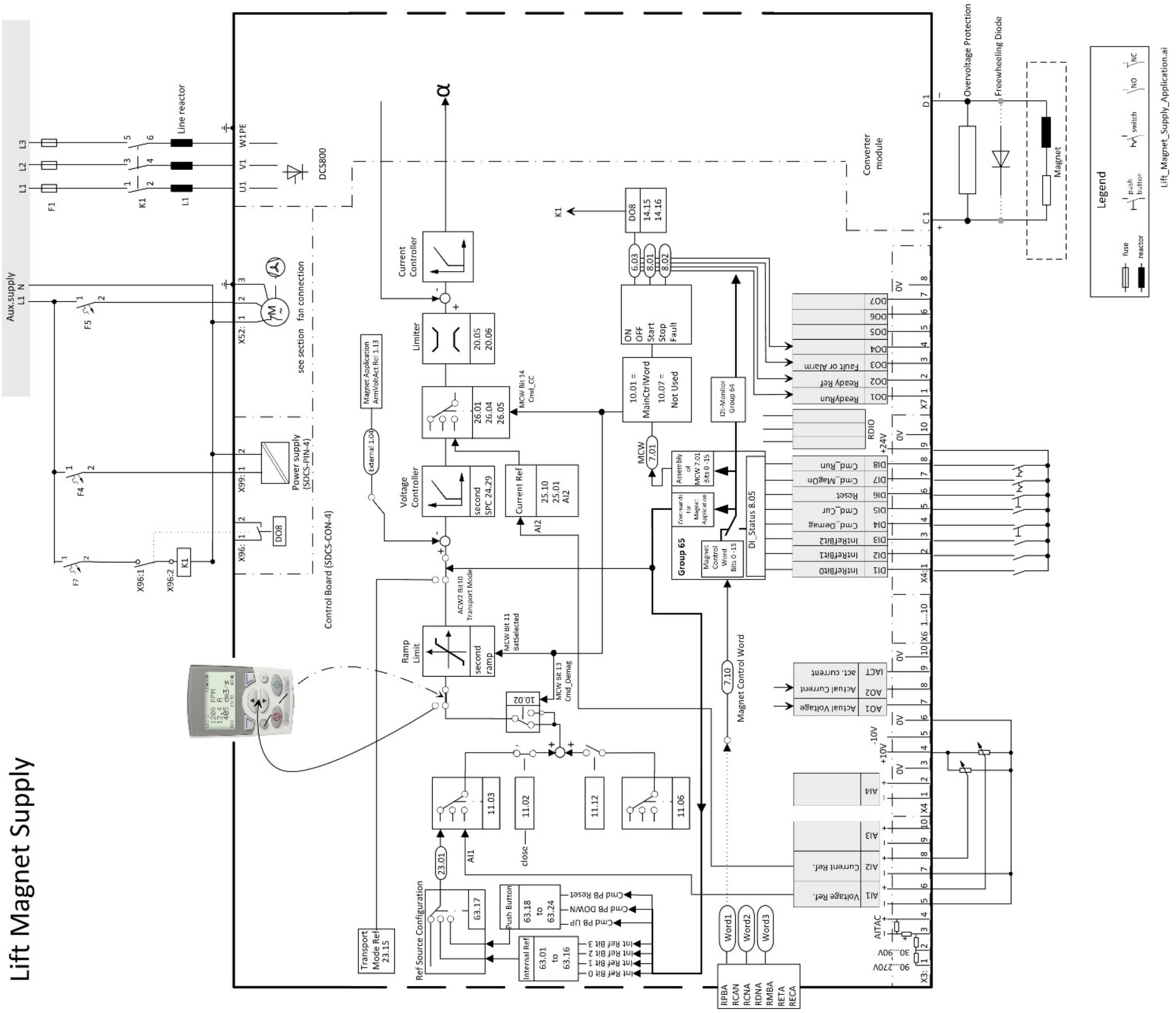
The application set up is to be done following the **functional description** starting on page 15.

Commissioning Parameters

Signal / Parameter name				
10.01 **CommandSel (command selector)** *UsedMCW (7.04)* selector: 1 = **MainCtrlWord** Magnet Supply is controlled via *MainCtrlWord (7.01)* Int. Scaling: 1 == 1 Type: C Volatile: N	Local I/O	FexLink	Local I/O	-
10.02 **Direction (direction of rotation used for command Demagnetization)** Binary signal for **Direction** is used for **Demagnetization**. *Direction (10.02)* allows to change the direction of voltage by negating the voltage reference in remote operation: 14 = **MCW Bit13** 1 = **Reverse (Demagnetization),** 0 = **Forward (Magnetization)** *MainCtrlWord (7.01)* bit 13 Int. Scaling: 1 == 1 Type: C Volatile: N	NotUsed	MCW Bit15	NotUsed	-
11.03 **Ref1Sel (speed reference 1 select used for voltage reference select)** Speed reference 1 value is used for magnet supply voltage reference: If ConfRefSrc (63.17) ` **Analog_Inp** then: 0 = **SpeedRef2301** *SpeedRef (23.01),* default If ConfRefSrc (63.17) = **Analog_Inp** then: 2 = **AI1** analog input AI1 3 = **AI2** analog input AI2 4 = **AI3** analog input AI3 5 = **AI4** analog input AI4 6 = **AI5** analog input AI5 7 = **AI6** analog input AI6 Int. Scaling: 1 == 1 Type: C Volatile: N	SpeedRef2301	MaxAI2AI4	SpeedRef2301	-
16.08 **SpeedCtrlUnit (Speed control unit)** Select speed control unit for all relevant parameters: 0 = **rpm** all parameters in the speed loop are displayed in units of rpm 1 = **Percent** all parameters in the speed loop are displayed in units of percent 2 = **Volt** all parameters in the speed loop are displayed in units of Volt **NOTE:** The speed control unit can be displayed as a voltage control unit. Int. Scaling: 1 == 1 Type: C Volatile: N	rpm	Volt	rpm	-

22.11 **Ramp2Select (ramp 2 selector is used for command Battery selected)** Select active ramp parameters : 14 = **MCW Bit11** 0 = parameter set 1 is active (**Magnet Supply Mode**), 1 = parameter set 2 is active (**Battery Mode**), MainCtrlWord (7.01) bit 11 Int. Scaling: 1 == 1 Type: C Volatile: N	Acc/Dcc1	MCW Bit15	Acc/Dcc1	-
25.10 **TorqRefA Sel (torque reference A selector)** Selector for *TorqRefExt (2.24)*: **<u>Current reference configuration:</u>** 1 = **AI1** analog input AI1 2 = **AI2** analog input AI2 3 = **AI3** analog input AI3 4 = **AI4** analog input AI4 5 = **AI5** analog input AI5 6 = **AI6** analog input AI6 Reserved for **Step by Step Release function**. Set and reset automatically by magnet software application: 0 = **TorqRefA2501** *TorqRefA (25.01),* default Int. Scaling: 1 == 1 Type: C Volatile: N	TorqRefA2501	AI6	TorqRefA2501	-
26.05 **TorqMux (torque multiplexer used to select current control)** *TorqMux (26.05)* selects a binary input to change between operation modes. The choice of the operation modes is provided by means of *TorqMuxMode (26.04)*. Torque reference multiplexer binary input: 15 = **MCW Bit14** 0 = voltage control, 1 = current control if *TorqMuxMode* (**26.04**) = Speed/Torque**,** *MainCtrlWord (7.01)* bit 14 Int. Scaling: 1 == 1 Type: C Volatile: N	NotUsed	MCW Bit15	NotUsed	-

Drawings



Appendix A – Used Standard DCS800 Parameters

Signal / Parameter name

7.01 **MainCtrlWord (main control word, MCW)**

The main control word contains all DCS800 depending commands and is written by the magnet software application:

Bit	Name	Value	Comment
B0	**On (Off1N)**	1	Command **Cmd_MagOn** to **RdyRun** state. With *MainContCtrlMode (21.16)* = **On**: Closes contactors and starts fans. With *MainContCtrlMode (21.16)* = **On&Run**: **RdyRun** flag in *MainStatWord (8.01)* is forced to 1
		0	Command to **Off** state. Stopping via *Off1Mode (21.02)*.
B1	**Off2N**	1	No **Off2** (Emergency Off / Coast Stop) B1 is forced to 1 by the magnet software application
B2	**Off3N**	1	No **Off3** (E-stop) B2 is forced to 1 by the magnet software application
B3	**Run**	1	Command **Cmd_RUN** (Magnet) to **RdyRef** state. The firing pulses are released and the magnet supply is running with the selected reference.
		0	Command to **RdyRun** state. Stop via *StopMode (21.03).*
B4	**RampOutZero**	1	no action / B4 is forced to 1 by the magnet software application
B5	**RampHold**	1	no action / B5 is forced to 1 by the magnet software application
B6	**RampInZero**	1	no action / B6 is forced to 1 by the magnet software application
B7	**Reset**	1	(**Cmd_Reset**) acknowledge fault indications with the positive edge
		0	no action
B8	**Inching1**	0	no action / B8 is forced to 0 by the magnet software application
B9	**Inching2**	0	no action / B9 is forced to 0 by the magnet software application
B10	**RemoteCmd**	1	control over magnet software application enabled B6 is forced to 1 by the magnet software application
B11	**Cmd_BatSel**	1	used by the magnet software application to control the command **Cmd_BatSel**. The battery parameters are selected. To be able to switch the ramp following parameter has to be assigned: **22.11 = MCW Bit11** (Ramp2Sel).
		0	no action
B12	**Cmd_BatDis**	1	used by the magnet software application to control the command **Cmd_BatDis** to select the discharging of the battery.
		0	no action
B13	**Cmd_DeMag**	1	used by the magnet software application to control the command **Cmd_DeMag** which is dedicated for Demagnetization. To be able to switch the direction the following parameter has to be assigned: **10.02 = MCW Bit13** (Direction).
		0	no action
B14	**Cmd_Cur**	1	used by the magnet software application to control the command **Cmd_Cur**. To be able to switch to current mode the following parameter has to be assigned: **26.05 = MCW Bit14** (TorqMux).
		0	no action
B15	**auxiliary bit**	0	no action / B15 is forced to 0 by the magnet software application

Int. Scaling: 1 == 1 Type: I Volatile: Y

Appendix B – Application Parameters

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 7	**Control Words** **additional to standard firmware**					
7.10	**MagMCW Incoming Magnet Main Control Word** Incoming control word from PLC: **DEFAULT CONFIGURATION**:**		-	-	-	

Bit	Default	Value	Command / Selection	Configuration
0	**IntRefBit3**	1	Internal references Bit 3	
		0	No action	
1	**PB_UP**	1	Push button UP	(**65.10 /** *ConfPB_UP*)
		0	No action	
2	**PB_DOWN**	1	Push button DOWN	(**65.11 /** *ConfPB_DOWN*)
		0	No action	
3	**PB_Reset**	1	Push button Reset	(**65.12 /** *ConfPB_Reset*)
		0	No action	
4	**reserved**	1	reserved	
		0	No action	
5	**reserved**	1	reserved	
		0	No action	
6	**Cmd_BatSel**	1	Battery selected	(**65.15 /** *ConfBatOn*)
		0	No action	
7	**Cmd_BatDis**	1	Battery discharging	(**65.16 /** *ConfBatDisCh*)
		0	No action	
8	**reserved**	1	reserved	
		0		
9	**reserved**	1	reserved	
		0		
10	**reserved**	1	reserved	
		0		
11	**reserved**	1	reserved	
		0		
12	**Magnet5act**	1	Magnet 5 I²t-Monitoring ON	(**65.21 /** *ConfMonMagnet5*)
		0	No action	
13	**Magnet6act**	1	Magnet 6 I²t-Monitoring ON	(**65.22 /** *ConfMonMagnet6*)
		0	No action	
14	**Magnet7act**	1	Magnet 7 I²t-Monitoring ON	(**65.23 /** *ConfMonMagnet7*)
		0	No action	
15	**Magnet8act**	1	Magnet 8 I²t-Monitoring ON	(**65.24 /** *ConfMonMagnet8*)
		0	No action	

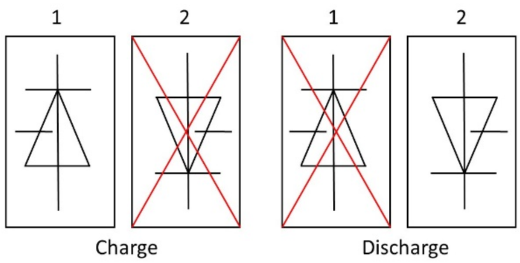
All available commands can be customized by **parameter group 65

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 8	**Status Words** **additional to standard firmware**					
8.05	**DI StatWord (incoming Magnet DI Statusword)** Incoming assigned **DI status word** to be controlled from PLC: **DEFAULT CONFIGURATION**:**	-	-	-		

Bit	**DigIn**	**Name**	**Value**	**Command / Selection**	**Configuration**
0	DI1	**IntRefBit0**	1	Internal references Bit 0	(**65.06** / *ConfRefBit0*)
			0	No action	
1	DI2	**IntRefBit1**	1	Internal references Bit 1	(**65.07** / *ConfRefBit1*)
			0	No action	
2	DI3	**IntRefBit2**	1	Internal references Bit 2	(**65.08** / *ConfRefBit2*)
			0	No action	
3	DI4	**Cmd_Demag**	1	Demagnetization	(**65.05** / *ConfDeMag*)
			0	No action	
4	DI5	**Cmd_Cur**	1	Current Control	(**65.04** / *ConfEnbCC*)
			0	No action	
5	DI6	**Reset**	1	Reset	(**65.03** / *ConfReset*)
			0	No action	
6	DI7	**Cmd_MagOn**	1	Magnet On	(**65.01** / *ConfMagOn*)
			0	No action	
7	DI8	**Cmd_Run**	1	Magnet RUN	(**65.02** / *ConfEnbRun*)
			0	No action	
8	DI9	**StepbyStepRel**	1	Step by Step Release	(**65.13** / *ConfStbyStRel*)
			0	No action	
9	DI10	**TransportMode**	1	Transport Mode	(**65.14** /*ConfTranspMode*)
			0	No action	
10	DI11	**Magnet1act**	1	Magnet 1 I²t-Monitoring ON	(**65.17** /*ConfMonMagnet1*)
			0	No action	
11	DI12	**Magnet2act**	1	Magnet 2 I²t-Monitoring ON	(**65.18** /*ConfMonMagnet2*)
			0	No action	
12	DI13	**Magnet3act**	1	Magnet 3 I²t-Monitoring ON	(**65.19** /*ConfMonMagnet3*)
			0	No action	
13	DI14	**Magnet4act**	1	Magnet 4 I²t-Monitoring ON	(**65.20** /*ConfMonMagnet4*)
			0	No action	
14 … 15		**reserved**	1		
			0		

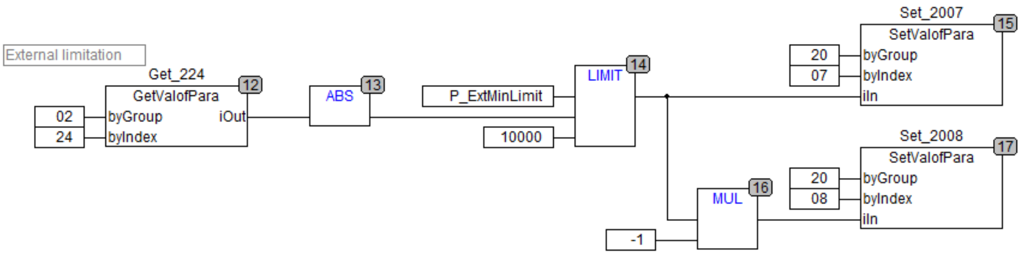
All available commands can be customized by **parameter group 65

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
8.15	**MagMSW (outgoing magnet main status word)** The customized main status word. **Bit** / **Name** / **Value** / **Comment** 0..2 / - - - / / not connected 3 / **Not tripped** / 1 / no fault / / 0 / fault indication 4..7 / - - - / 1 / not connected / / 0 / 8 / **UrefUact** / 1 / voltage reference is reached / / 0 / actual voltage is out of hysteresis 9..15 / - - - / 1 / not connected / / 0 /	-	-	-		

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 60	**Application** **Magnet application**					
60.01	**ParaTrans (parameter change over between group 61 and 62 allowed)** There are parameter groups existing for the different load types of magnet (**group 61**) and battery (**group 62**), which have to be written to certain standard firmware parameters for the selected load type. Group 61 contains of the parameters for magnet load and group 62 for battery load. With this parameter the transfer can be released or not. Parameter switching-over and transferring is released: 0 = **No** No parameters are written, neither from group 61 nor from group 62 1 = **Yes** Parameters are written dependent on **Cmd_BatSel = MCW Bit 11** **NOTE:** If 60.01 = **Yes** then the parameters in group 61 (Cmd_BatSel = MCW Bit 11 = FALSE) or group 62 (Cmd_BatSel = MCW Bit 11 = TRUE) write to certain standard firmware parameters. If 60.01 = **No** then the standard firmware parameters are not written neither from group 61 nor from group 62. This helps for example in auto tune processes or optimizing those standard firmware parameters during commissioning. Internal name : P_CrtlLoc **Type: C**	No	Yes	No	-	E
60.02	**BridgeBlock (blocking of thyristor bridges allowed)** The antiparallel negative bridge of the selected mode (battery charge or discharge) will be blocked, if this parameter 60.04 is set to **Yes**. Otherwise both bridges will not be blocked.  The bridge 2 will be blocked: 0 = **No** 1 = **Yes** Internal name : P_BlockBri **Type: C**	No	Yes	Yes	-	E

<table>
<tr><th>Index</th><th>Signal / Parameter name</th><th>min.</th><th>max.</th><th>def.</th><th>unit</th><th>E/C</th></tr>
<tr><td>60.03</td><td>

ExtMinLimit (minimal value of external limitation)
The value will limit a selected external current limitation. Is this external limitation not desired the value should be set to 100%.

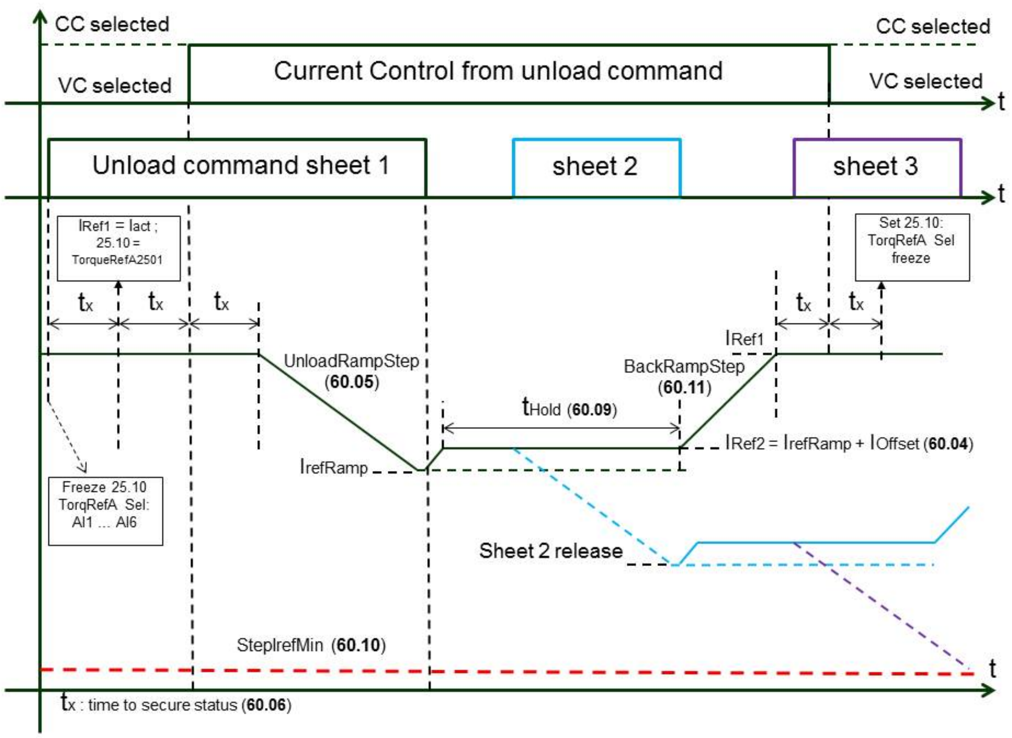


Internal name : P_ExtMinLimit

Int. Scaling: 100 == 1 % Type: I

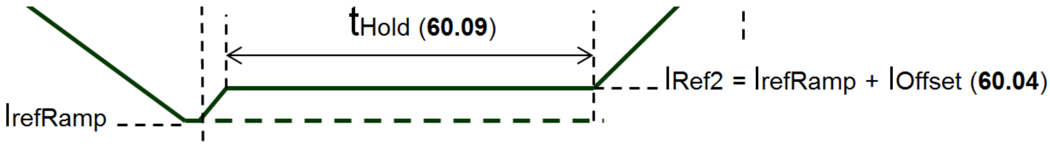
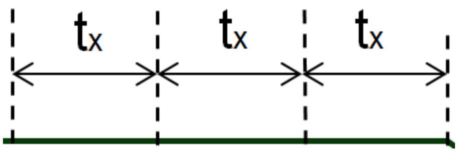
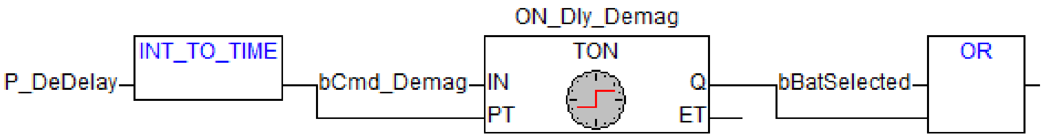
</td><td>0</td><td>100.00</td><td>100.00</td><td>%</td><td>E</td></tr>
<tr><td></td><td>

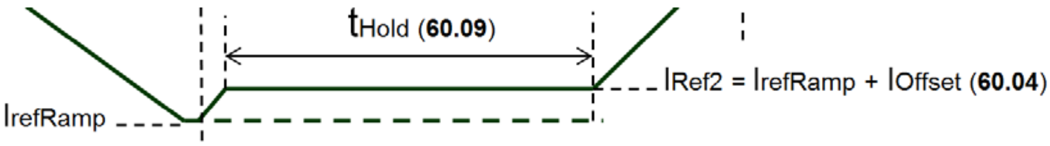
Step by Step sheet release



</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Appendix B

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
60.04	**Ioffset (current offset value for Step by Step Sheet Release)** This value is a current offset to ensure a secure magnetizing state after releasing one sheet. The value can be set from 0% to 100%.  Internal name : Ioffset **Int. Scaling: 100 == 1 % Type: I**	0	100.00	1.00	%	E
60.05	**UnloadRampStep (ramp time for current reference reducing in Step by Step Sheet Release)** The ramp time is value which says how many % of the current reference are reduced per second to allow the release of sheets step by step. Internal name : UnloadRampStep **Int. Scaling: 100 == 100 % / s Type: I** **10 == 10 % / s** **1 == 1 % / s**	1	1000	10	-	E
60.06	**SecureStateDelay (time to secure status in Step by Step Sheet Release mode)** This delay time ensures that each and every release state is reached reliably.  Internal name : P_SecureStateDelay **Int. Scaling: 100 == 100 ms Type: I**	0	10000	100	ms	
60.07	**DeDelay (ON delay time with DEMAGNETIZATION command)** This is a delay time for the ON command during switch over of signs and limitations before demagnetization.  Internal name : P_DeDelay **Int. Scaling: 100 == 100 ms Type: I**	0	3000	0	ms	

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
60.08	**HoldTimeSel (enable/disable delay time before leaving Step by Step Sheet Release mode)** The HoldTimeDelay (**60.09**) and herewith the possibility to leave this operation mode to normal mode after dropping the step by step sheet release push button can be enabled or disabled by this parameter. The reason behind this parameter is the decision to leave the step by step sheet release mode after an elapsed hold time to a normal operation like magnetization mode or with a STOP command (RdyRef = FALSE) of the converter. **Enabled** means the user has the possibility to leave the step by step sheet release mode to a normal operation like magnetization mode after the hold time has elapsed or to continue within the hold time to release the next sheet by pressing the step by step sheet release push button again. **Disabled** means the user has the possibility to continue to release the next sheet by pressing the step by step sheet release push button again or to leave the step by step sheet release mode with a STOP command (RdyRef = FALSE). The: 0 = **Disabled** 1 = **Enabled** Internal name : HoldTimeSel **Type: C**	Disabled	Enabled	Enabled	-	E
60.09	**HoldTimeDelay (delay time before leaving the Step by Step Sheet Release mode)** Within the hold delay time after dropping the step by step sheet release push button the user has the possibility to leave the step by step sheet release mode to a normal operation like magnetization mode after the hold time has elapsed or to continue within the hold time to release the next sheet by pressing the step by step sheet release push button again.  Internal name : P_HoldTimeDelay **Int. Scaling: 100 == 100 ms Type: I**	0	65535	1000	ms	
60.10	**StepIrefMin (minimum current reference for Step by Step Sheet Release mode)** This is the minimum current reference that can be reached while decreasing the magnet current in Step by Step sheet release mode. Internal name : StepIrefMin **Int. Scaling: 100 == 1 % Type: I**	0	100.00	100.00	%	E
60.11	**BackRampStep (ramp time for current reference increasing after Sheet Release)** The ramp time is a value which says how many % of the current reference are increased per second after the sheet release and the elapsed hold time delay (60.08). Internal name : BackRampStep **Int. Scaling: 100 == 100 % / s Type: I** **10 == 10 % / s** **1 == 1 % / s**	1	1000	10	-	E

<table>
<tr><th>Index</th><th>Signal / Parameter name</th><th>min.</th><th>max.</th><th>def.</th><th>unit</th><th>E/C</th></tr>
<tr><td>60.12</td><td>AutoRunSel (RUN & ON command are joined together by the ON command)
RUN command and ON command are joined together and selected by the ON command if this parameter is enabled. This is to be able to use just one digital input signal or one bit to start the magnet supply.

Magnet RUN and ON command are selected by just the Magnet ON command:
0 = Disabled
1 = Enabled
Internal name : AutoRunSel
Type: C</td><td>Disabled</td><td>Enabled</td><td>Disabled</td><td>-</td><td>E</td></tr>
<tr><td>60.13</td><td>RESEToverSTOP (RESET command is initiated by the STOP command)
The RESET command is initiated by the STOP command if this parameter is enabled. This is to be able to reset the converter without an additional RESET command.

The RESET and the STOP command are joined together:
0 = Disabled
1 = Enabled
Internal name : RESET_over_STOP
Type: C</td><td>Disabled</td><td>Enabled</td><td>Disabled</td><td>-</td><td>E</td></tr>
<tr><td>60.14</td><td>PBRESEToverSTOP (PB_RESET command is initiated by the STOP command)
The PB_RESET command is initiated by the STOP command if this parameter is enabled. This is to be able to reset the Push Button Reference without an additional PB_RESET command.

The PUSH BUTTON RESET and STOP command are joined together:
0 = Disabled
1 = Enabled
Internal name : PBReset_over_STOP
Type: C</td><td>Disabled</td><td>Enabled</td><td>Disabled</td><td>-</td><td>E</td></tr>
<tr><td>60.15</td><td>DeMagMode (configuration of demagnetization mode)
With this parameter the demagnetization mode can be configured.
The demagnetization modes can be selected as follows:

0 = Demagnetize (Inversion of voltage or current reference)
1 = Degaussing (Demagnetization of magnets by pulsing while following a damped oscillation curve)

Internal name : P_DeMagMode
Type: C</td><td>Demagnetize</td><td>Degaussing</td><td>Demagnetize</td><td>-</td><td>E</td></tr>
<tr><td>60.16</td><td>DegausTimeConst (time constant for the falling exponential-function-curve)
This time constant equals the τ of the exponential-function-curve used in Degaussing mode.

Internal name : DegaussingTime
Int. Scaling: 100 == 100 ms Type: I</td><td>0</td><td>30000</td><td>20000</td><td>ms</td><td></td></tr>
</table>

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
60.17	**DegausPulseWidth (time constant for the pulse width)** This time constant equals the pulse width of the pulses used in Degaussing mode. Internal name : PulseWidth **Int. Scaling: 100 == 100 ms Type: I**	0	20000	1000	ms	
60.18	**CurZeroLevel (adjustable threshold level for zero current detection)** This threshold level is to adjust the zero current detection level used in Degaussing mode. When the current falls below the threshold level, the pulse amplitude with the reverse sign is set. Internal name : iIactZeroLevel **Int. Scaling: 100 == 1 % Type: I**	0.01	100.00	2.00	%	
60.19	**DeMagRef (Signal for actual degaussing pulse amplitude)** This signal shows the actual pulse amplitude in Degaussing mode. Internal name : iDeMagRef **Int. Scaling: 1 == 1 % Type: SI**	0	100	0	%	E
60.20	**MagRefDec (Signal the falling exponential-function-curve)** This signal shows the actual value of the falling exponential-function-curve in Degaussing mode. Internal name : iMagRefFiltered **Int. Scaling: 1 == 1 % Type: SI**	0	100	0	%	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 61	**Magnet Parameter** **Magnet application**					
61.01	**LimitPosMag (positive current limitation using magnet)** This value will be written to parameter TorqMax (20.05), if magnet is selected. Internal name : P_LimPos_Mag **Int. Scaling: 100 == 1 % Type: SI**	0.00	325.00	100.00	%	E
61.02	**LimitNegMag (negative current limitation using magnet)** This value will be written to parameter TorqMin (20.06), if magnet is selected Internal name : P_LimNeg_Mag **Int. Scaling: 100 == 1 % Type: SI**	0.00	-325.00	-100.00	%	E
61.03	**UdcFiltMag (filter time constant for actual voltage using magnet)** This filter time constant will be written to SpeedFiltTime (50.06), if magnet is selected. Internal name : P_UFilt_Mag **Int. Scaling: 1 == 1 ms Type: I**	0.00	10000	20	ms	E
61.04	**KpVMag (p-part voltage controller using magnet)** This value will be written to KpS (24.03), if magnet is selected. Internal name : P_KpV_Mag **Int. Scaling: 100 == 1 % Type: I**	0.00	325.00	5.00	%	E
61.05	**TiVMag (I-part voltage controller using magnet)** This value will be written to KpS (24.09), if magnet is selected. Internal name : P_TiV_Mag **Int. Scaling: 1 == 1 ms Type: I**	0	64000	2500	ms	E
61.06	**ContCurMag (discontinuous current limit using magnet)** This value will be written to M1DiscontCurLim (43.08), if magnet is selected. Internal name : P_ContCurMag **Int. Scaling: 100 == 1 % Type: I**	0.00	325.00	100.00	%	E
61.07	**KpCMag (p-part current controller using magnet)** This value will be written to M1KpArmCur (43.06), if magnet is selected. Internal name : P_KpC_Mag **Int. Scaling: 100 == 1 Type: I**	0.00	100.00	1.00	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
61.08	**TiCMag (i-part current controller using magnet)** This value will be written to M1TiArmCur (43.07), if magnet is selected. Internal name : P_TiC_Mag **Int. Scaling: 1 == 1 ms Type: I**	0	10 000	50	ms	E
61.09	**LMag (inductance value using magnet)** This value will be written to M1ArmL (43.09), if magnet is selected. Internal name : P_L_Mag **Int. Scaling: 1 == 1 Type: I**	0.00	640	0	mH	E
61.10	**RMag (resistance value using magnet)** This value will be written to M1ArmR (43.10), if magnet is selected. Internal name : P_R_Mag **Int. Scaling: 1 == 1 mOhm Type: I**	0	65500	0	mOhm	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 62	**Battery Parameter** **Magnet application**					
62.01	**LimitPosBat (positive current limitation using battery)** This value will be written to parameter TorqMax (20.05), if battery is selected. Internal name : P_LimPos_Bat **Int. Scaling: 100 == 1 % Type: SI**	0.00	325.00	100.00	%	E
62.02	**LimitNegBat (negative current limitation using battery)** This value will be written to parameter TorqMin (20.06), if battery is selected Internal name : P_LimNeg_Bat **Int. Scaling: 100 == 1 % Type: SI**	0.00	-325.00	-100.00	%	E
62.03	**UdcFiltBat (filter time constant for actual voltage using battery)** This filter time constant will be written to SpeedFiltTime (50.06), if battery is selected. Internal name : P_UFilt_Bat **Int. Scaling: 1 == 1 ms Type: I**	0.00	10000	20	ms	E
62.04	**KpVBat (p-part voltage controller using battery)** This value will be written to KpS (24.03), if battery is selected. Internal name : P_KpV_Bat **Int. Scaling: 100 == 1 % Type: I**	0.00	325.00	5.00	%	E
62.05	**TiVBat (I-part voltage controller using battery)** This value will be written to KpS (24.09), if battery is selected. Internal name : P_TiV_Bat **Int. Scaling: 1 == 1 ms Type: I**	0	64000	2 500	ms	E
62.06	**ContCurBat (discontinuous current limit using battery)** This value will be written to M1DiscontCurLim (43.08), if battery is selected. Internal name : P_ContCurBat **Int. Scaling: 100 == 1 % Type: I**	0.00	325.00	100.00	%	E
62.07	**KpCBat (p-part current controller using battery)** This value will be written to M1KpArmCur (43.06), if battery is selected. Internal name : P_KpC_Bat **Int. Scaling: 100 == 1 Type: I**	0.00	100.00	1.00	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
62.08	**TiCBat (i-part current controller using battery)** This value will be written to M1TiArmCur (43.07), if battery is selected. Internal name : P_TiC_Bat **Int. Scaling: 1 == 1 ms Type: I**	0	10 000	50	ms	E
62.09	**LBat (inductance value using battery)** This value will be written to M1ArmL (43.09), if battery is selected. Internal name : P_L_Bat **Int. Scaling: 1 == 1 Type: I**	0.00	640	0	mH	E
62.10	**RBat (resistance value using battery)** This value will be written to M1ArmR (43.10), if battery is selected. Internal name : P_R_Bat **Int. Scaling: 1 == 1 mOhm Type: I**	0	65500	0	mOhm	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 63	**Reference Configuration** **Magnet application**					
	Selectable internal voltage references ConfRefSrc (63.17) = **Int_Ref**: The reference value can be selected by a table of fixed values IntRef01 – IntRef16 (**63.01** – **63.16**). It is possible to select between 16 fixed internal values via 4 Bits (BCD). The selected internal reference is written to parameter **23.01**.					
	The commands *IntRefBit0*, *IntRefBit1*, *IntRefBit2* and *IntRefBit3* can be set via digital input or Magnet Control Word (7.10) and customized by parameter group 65: *ConfRefBit0* (65.06 / Internal Reference **Bit 0**), *ConfRefBit1* (65.07 / **Bit 1**) *ConfRefBit2* (65.08 / **Bit 2**) and *ConfRefBit3* (65.09 / **Bit 3**).					

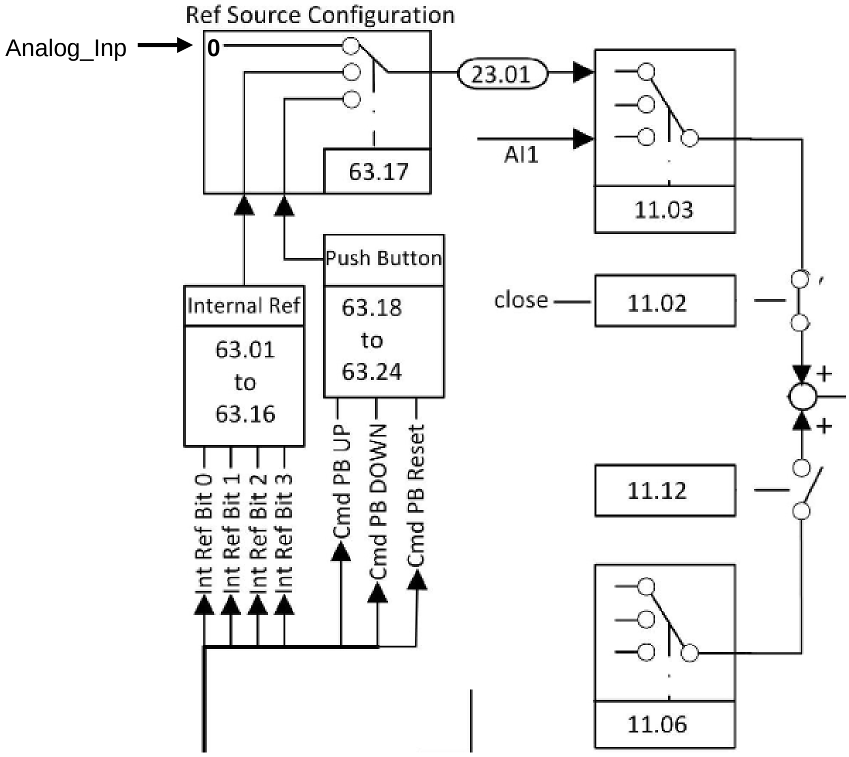
Bit 3	Bit 2	Bit 1	Bit 0	Internal Reference (Fixed Set Points)
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	5
0	1	0	1	6
0	1	1	0	7
0	1	1	1	8
1	0	0	0	9
1	0	0	1	10
1	0	1	0	11
1	0	1	1	12
1	1	0	0	13
1	1	0	1	14
1	1	1	0	15
1	1	1	1	16

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
63.01	**IntRef01 (internal reference 1)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef1 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.02	**IntRef02 (internal reference 2)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef2 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.03	**IntRef03 (internal reference 3)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef3 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.04	**IntRef04 (internal reference 4)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef4 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.05	**IntRef05 (internal reference 5)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef5 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.06	**IntRef06 (internal reference 6)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef6 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.07	**IntRef07 (internal reference 7)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef7 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
63.08	**IntRef08 (internal reference 8)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef8 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.09	**IntRef09 (internal reference 9)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef9 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.10	**IntRef10 (internal reference 10)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef10 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.11	**IntRef11 (internal reference 11)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef11 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.12	**IntRef12 (internal reference 12)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef12 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.13	**IntRef13 (internal reference 13)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef13 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.14	**IntRef14 (internal reference 14)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef14 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
63.15	**IntRef15 (internal reference 15)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef15 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.16	**IntRef16 (internal reference 16)** This reference can be selected by digital inputs or the Magnet Control Word (**7.10**) if ConfRefSrc (63.17) = **Int_Ref**. See table at the beginning of this group 63. Internal name : P_IntRef16 **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E

<u>Reference Configuration</u>

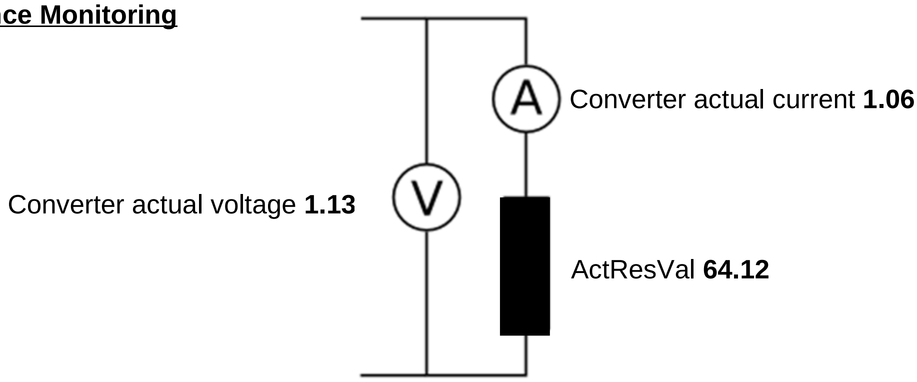


Index	Signal / Parameter name	min.	max.	def.	unit	E/C
63.17	**ConfRefSrc (configuration of voltage reference source)** With this parameter the reference source in voltage control can be configured. The reference source can be selected as follows: 0 = **Analog_Inp** ’ (**11.03** = AI1…AI6) 1 = **Int_Ref** ’ (**11.03** = SpeedRef2301) 2 = **PB_cont** ’ (**11.03** = SpeedRef2301) 3 = **PB_step** ’ (**11.03** = SpeedRef2301) **NOTE:** Parameter 11.03 has to be set manually; see page 24: commissioning parameters! Internal name : P_SelRefSrc **Type: C**	Analog_Inp	PB_step	Analog_Inp	-	E

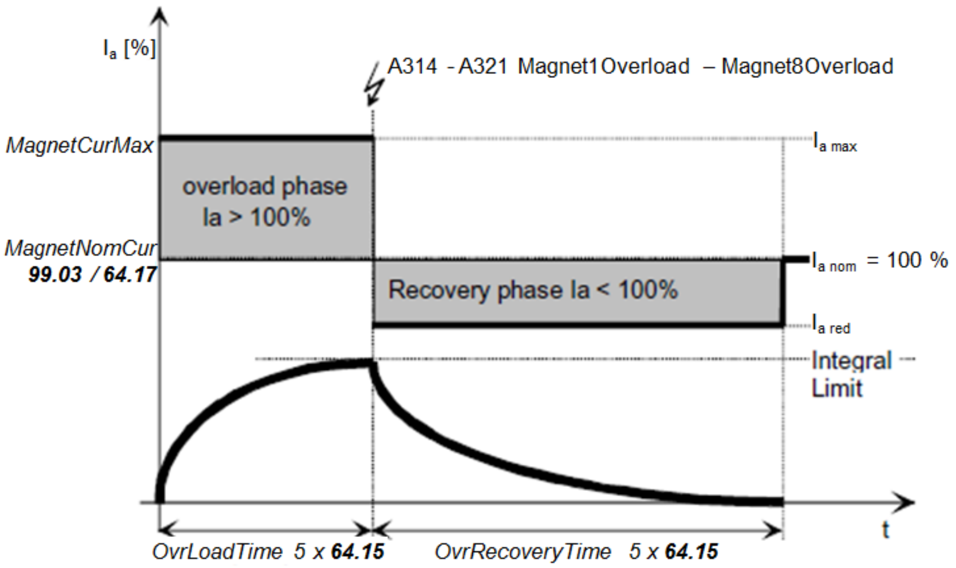
Index	Signal / Parameter name	min.	max.	def.	unit	E/C
63.18	**PB_RefRamp (reference change rate per second for push button continuous function)** This parameter is used if ConfRefSrc (63.17) = **PB_cont**. The reference increases continuously with the configured reference change rate per second while the **PB_UP** push button is pressed. With the push button **PB_DOWN** the reference decreases continuously with the same configured reference change rate per second. The push button source (DI or MagCW) of **PB_UP** can be configured in ConfPB_UP (**65.10**) and the push button source of **PB_DOWN** can be configured in ConfPB_UP (**65.11**). Internal name : PB_RefRamp **Int. Scaling: 100 == 100 % / s Type: I** **10 == 10 % / s** **1 == 1 % / s**	1	1000	10	%/s	E
63.19	**PB_RefStep (reference change step for push button step function)** This parameter is used if ConfRefSrc (63.17) = **PB_step**. The reference increases with the configured reference change step once the **PB_UP** command is pressed. To increase the reference again with the configured reference change step the **PB_UP** push button has to be pressed once again. The reference decreases with the same configured reference change step once the **PB_DOWN** push button is pressed. To decrease the reference again with the configured reference change step the **PB_DOWN** push button has to be pressed once again. The push button source (DI or MagCW) of **PB_UP** can be configured in ConfPB_UP (**65.10**) and the push button source of **PB_DOWN** can be configured in ConfPB_UP (**65.11**). Internal name : PB_RefStep **Int. Scaling: 100 == 1 % Type: I**	0	100.00	0	%	E
63.20	**PB_ResetRef (reset value for push button modes)** This parameter is used if ConfRefSrc (63.17) = **PB_cont** or ConfRefSrc (63.17) = **PB_step**. When the **PB_Reset** command is active then the reference value is set to PB_ResetRef (**63.20**). The push button source (DI or MagCW) of **PB_Reset** can be configured in ConfPB_Reset (**65.12**) Internal name : PB_ResetRef **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.21	**PB_ActValFreeze (actual push button value frozen before power down)** This parameter is used if ConfRefSrc (63.17) = **PB_cont** or ConfRefSrc (63.17) = **PB_step**. The actual push button reference value is frozen before power down. With PB_RefPowerON (**63.22**) it is possible to select PB_ActValFreeze (**63.21**) as initial value for the push button modes after power on. Internal name : PB_ActValFreeze **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
63.22	**PB_RefPowerOn (configuration of reference value at power on in push button modes)** This parameter is used if ConfRefSrc (63.17) = **PB_cont** or ConfRefSrc (63.17) = **PB_step**. The reference initial value for the push button modes can be selected with this parameter. **Zero** means that the initial value is 0, **ResetRef** takes the value of parameter PB_ResetRef (**63.20**) and with **FreezeVal** the last frozen value before power down of parameter PB_ActValFreeze (**63.21**) is taken. The reference initial value for the push button modes can be configured as follows: 0 = **Zero** 1 = **ResetRef** 2 = **FreezeVal** Internal name : P_RefPowerOn **Type: C**	Zero	FreezeVal	Zero	-	E
63.23	**PB_RefMin (Minimum reference for push button modes)** Minimum reference limit in % for push button modes. This parameter is used if ConfRefSrc (63.17) = **PB_cont** or ConfRefSrc (63.17) = **PB_step**. Internal name : PB_RefMin **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E
63.24	**PB_RefMax (Maximum reference for push button modes)** Maximum reference limit in % for push button modes. This parameter is used if ConfRefSrc (63.17) = **PB_cont** or ConfRefSrc (63.17) = **PB_step**. Internal name : PB_RefMax **Int. Scaling: 100 == 1 % Type: SI**	-100.00	100.00	0	%	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 64	**Monitoring** **Magnet application**					
64.01	**UacUnderV (under voltage alarm level)** In the DCS800 alarm **A311** (M_Undervoltg) will be generated, if MainVoltActRel (**1.11**) is lower than the value of this parameter. Alarm **A111** (MainsLowVoltage) in sequence with Fault **F512** (MainsLowVoltage) are not practicable here because disabling the converter isn't allowed. For that reason the limits in the parameters UNetMin1 (**30.22**) and UNetMin2 (**30.23**) must be set to the lowest possible values and parameter UacUnderV (**64.01**) has to be used for under voltage alarm monitoring. Internal name : P_Uac_UnderV **Int. Scaling: 100 == 1 % Type: SI**	0.00	150.00	80.00	%	
64.02	**UdcFilt (filter time constant)** The actual value of signal parameter ArmVoltActRel (**1.13**) will be filtered using this time constant. Internal name : P_UdcFilt **Int. Scaling: 1 == 1 ms Type: SI**	0	10000	1000	ms	
64.03	**UdcAct (output of filtered DC voltage) READ ONLY** The signal parameter ArmVoltActRel (**1.13**) will be filtered (see **64.02**), scaled (see **64.04** and **64.05**) and written to UdcAct (**64.03**). Internal name : P_UdcAct **Int. Scaling: 100 == 1 % Type: SI**	-200.00	200.00	0	%	
64.04	**UdcSca (scale factor of filtered output DC voltage)** The signal parameter ArmVoltActRel (**1.13**) is scaled, so that the desired output voltage of AOx (via parameter **64.03**) is reached. Internal name : P_UdcSca **Int. Scaling: 100 == 1 % Type: SI**	-320.00	320.00	100.00	%	
64.05	**UdcOffs (offset of filtered output DC voltage)** If necessary an offset can be added. The parameter value of 1000 means 1V at the AOx (via parameter **64.03**). Internal name : P_UdcOffs **Int. Scaling: 1 000 == 1V Type: SI**	-5000	+5000	0		

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
	<u>Resistance Monitoring</u>  					
64.06	**MagResMonitor (magnet resistance monitor enabled/disabled)** Alarm messages **A312** (ResistorHot) and **A313** (ResistorCold) together with the 2 alarm indicator bit parameters AlarmResHot (**64.11**) and AlarmResCold (**64.10**) of the magnet resistance monitor are enabled or disabled with this parameter. The actual resistance value ActResVal (**64.12**) is always displayed while status bit RdfRef (**8.01 Bit 2**) = **TRUE**. If RdfRef = FALSE then ActResVal (**64.12**) = 0. The magnet resistance monitor can be configured: 0 = **Disabled** 1 = **Enabled** Internal name : MagResMonitor **Type: C**	Disabled	Enabled	Disabled	-	E
64.07	**ResLimUp (upper resistance limit for alarm A312)** ResLimUp defines the threshold level for the alarm message **A312** (ResistorHot) and the alarm indicator bit parameter AlarmResHot (**64.11**). Internal name: ResLimUp **Int. Scaling: 1 == 1** mΩ **Type: I**	0	65535	0	m&	E
64.08	**ResLimDown (lower resistance limit for alarm A313)** ResLimDown defines the threshold level for the alarm message **A313** (ResistorCold) and the alarm indicator bit parameter AlarmResCold (**64.10**). Internal name: ResLimDown **Int. Scaling: 1 == 1** mΩ **Type: I**	0	65535	0	m&	E
64.09	**ResLimHysteresis (hysteresis for both ResLimUp and ResLimDown)** ResLimHysteresis defines the reset value for both alarm messages **A312** and **A313**: Reset value alarm message **A313** and AlarmResCold (**64.10**) ≥ ResLimDown + ResLimHysteresis (**64.08**) (**64.09**) Reset value alarm message **A312** and AlarmResHot (**64.11**) ≤ ResLimUp - ResLimHysteresis. (**64.07**) (**64.09**) Internal name: ResLimHysteresis **Int. Scaling: 1 == 1** mΩ **Type: I**	0	65535	0	m&	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
64.10	**AlarmResCold (indicator for alarm A313)** The alarm **A313** (ResistorCold) is indicated in this **read only** parameter: 0 = **FALSE** ActResVal (**64.12**) ≥ ResLimDown (**64.08**) + ResLimHysteresis (**64.09**) 1 = **TRUE** ActResVal (**64.12**) ≤ ResLimDown (**64.08**) Internal name : AlarmResCold **Type: C**	FALSE	TRUE	FALSE	-	E
64.11	**AlarmResHot (indicator for alarm A312)** The alarm **A312** (ResistorHot) is indicated in this **read only** parameter: 0 = **FALSE** ActResVal (**64.12**) ≤ ResLimUp(**64.07**) - ResLimHysteresis (**64.09**) 1 = **TRUE** ActResVal (**64.12**) ≥ ResLimUp (**64.07**) Internal name : MagResHot **Type: C**	FALSE	TRUE	FALSE	-	E
64.12	**ActResVal (actual resistance)** The actual resistance is a **read only** parameter and calculated with the actual voltage divided by the actual current following Ohm's law. Internal name: ActualResistance **Int. Scaling: 1 == 1** mΩ **Type: I**	0	65535	0	m&	E
	<u>Magnet I²t-function</u>					



<table>
<tr><th>Index</th><th>Signal / Parameter name</th><th>min.</th><th>max.</th><th>def.</th><th>unit</th><th>E/C</th></tr>
<tr><td>64.13</td><td>MagOvrlSetLev (magnet overload set level)
This parameter defines the set level for overload alarm from magnet 1 to 8.
The set level for overload alarms can be set from 0 – 300%.

Internal name : MagOvrlSetLevel

Int. Scaling: 1 == 1 % Type: SI</td><td>0</td><td>300</td><td>110</td><td>%</td><td>E</td></tr>
<tr><td>64.14</td><td>MagOvrlResLev (magnet overload reset level)
This parameter defines the reset level for overload alarm from magnet 1 to 8.
The reset level for overload alarms can be set from 0 – 300% but is limited by MagOvrlSetLev (64.13).

Internal name : MagOvrlResLevel

Int. Scaling: 1 == 1 % Type: SI</td><td>0</td><td>300</td><td>100</td><td>%</td><td>E</td></tr>
<tr><td>64.15</td><td>ThermTimeConst (thermal time constant τ of the magnet)
The thermal time constant τ [s] of the magnet can be configured here. The square of the actual overall magnet current (1.06) is multiplied with the sample time to calculate the individual actual overload value in each I²t accumulator.
OvrlMag1Accu (64.21) - OvrlMag8Accu (64.28) of the selected magnets within an exponential function.

$$\text{OverloadMagnetAccumulator} = \frac{Iact^2}{IN^2} * \left[1-e^{-\frac{t}{T}}\right] * 100\% = \frac{(1.06)^2}{(99.03)^2} * \left[1-e^{-\frac{t}{(64.15)}}\right]$$
Internal name: ThermTimeConst

Int. Scaling: 1 == 1 s Type: I</td><td>0</td><td>65535</td><td>3600</td><td>s</td><td>E</td></tr>
<tr><td>64.16</td><td>MagnetSW_Ovrld (status word of magnet overload alarms)
This read only parameter shows the status of all magnet overload alarms.

<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Comment</th></tr>
<tr><td>0</td><td>Magnet 1 Overload</td><td>1
0</td><td>Magnet 1 I²t set level reached</td></tr>
<tr><td>1</td><td>Magnet 2 Overload</td><td>1
0</td><td>Magnet 2 I²t set level reached</td></tr>
<tr><td>2</td><td>Magnet 3 Overload</td><td>1
0</td><td>Magnet 3 I²t set level reached</td></tr>
<tr><td>3</td><td>Magnet 4 Overload</td><td>1
0</td><td>Magnet 4 I²t set level reached</td></tr>
<tr><td>4</td><td>Magnet 5 Overload</td><td>1
0</td><td>Magnet 5 I²t set level reached</td></tr>
<tr><td>5</td><td>Magnet 6 Overload</td><td>1
0</td><td>Magnet 6 I²t set level reached</td></tr>
<tr><td>6</td><td>Magnet 7 Overload</td><td>1
0</td><td>Magnet 7 I²t set level reached</td></tr>
<tr><td>7</td><td>Magnet 8 Overload</td><td>1
0</td><td>Magnet 8 I²t set level reached</td></tr>
<tr><td>8 - 15</td><td>reserved</td><td></td><td></td></tr>
</table></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
64.17	**NumberOfMagnets (number of connected magnets in the system)** This value is very important for the calculation of the separated I²t accumulators. The I²t calculation needs to know how many magnets are supplied by the rated current value in parameter 99.03. With the number of active magnets it is now possible to calculate how much current of the complete nominal converter current is related as nominal current of one connected magnet. **Example:** 99.03 = 100 A; 64.17 = 4 and 2 of 4 magnets are actually active and connected to the converter. With the magnet lift supply in operation actually parameter 1.06 = 5000 (50 A). The actual current of each magnet is 25 A (parameter 99.03 **:** 4) which is equal to the magnet rated current. This means that both active magnets get an input value of 100% into their separate I²t calculation. Internal name : NumberOfMagnets **Type: Byte**	1	8	1	-	E
64.18	**MagCurSim (magnet current simulation)** This parameter is to simulate magnet current for I²t accumulator testing and it is active with values > 0. Internal name : MagCurSim **Int. Scaling: 100 == 1 % Type: SI**	0	300.00	0	%	E
64.19						
64.21	**OvrlMag1Accu (magnet 1 overload accumulator)** OvrlMag1Accu is in operation if the **Magnet1act** command is set. If the **Magnet1act** command is not set or reset then OvrlMag1Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet1act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet1 **(65.17).** Internal name : OverloadMagnet1Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E
64.22	**OvrlMag2Accu (magnet 2 overload accumulator)** OvrlMag2Accu is in operation if the **Magnet2act** command is set. If the **Magnet2act** command is not set or reset then OvrlMag2Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet2act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet2 **(65.18).** Internal name : OverloadMagnet2Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E
64.23	**OvrlMag3Accu (magnet 3 overload accumulator)** OvrlMag3Accu is in operation if the **Magnet3act** command is set. If the **Magnet3act** command is not set or reset then OvrlMag3Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet3act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet3 **(65.19).** Internal name : OverloadMagnet3Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
64.24	**OvrlMag4Accu (magnet 4 overload accumulator)** OvrlMag4Accu is in operation if the **Magnet4act** command is set. If the **Magnet4act** command is not set or reset then OvrlMag4Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet4act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet4 **(65.20).** Internal name : OverloadMagnet4Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E
64.25	**OvrlMag5Accu (magnet 5 overload accumulator)** OvrlMag5Accu is in operation if the **Magnet5act** command is set. If the **Magnet5act** command is not set or reset then OvrlMag5Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet5act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet5 **(65.21).** Internal name : OverloadMagnet5Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E
64.26	**OvrlMag6Accu (magnet 6 overload accumulator)** OvrlMag6Accu is in operation if the **Magnet6act** command is set. If the **Magnet6act** command is not set or reset then OvrlMag6Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet6act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet6 **(65.22).** Internal name : OverloadMagnet6Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E
64.27	**OvrlMag7Accu (magnet 7 overload accumulator)** OvrlMag7Accu is in operation if the **Magnet7act** command is set. If the **Magnet7act** command is not set or reset then OvrlMag7Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet7act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet7 **(65.23).** Internal name : OverloadMagnet7Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E
64.28	**OvrlMag8Accu (magnet 8 overload accumulator)** OvrlMag8Accu is in operation if the **Magnet8act** command is set. If the **Magnet8act** command is not set or reset then OvrlMag8Accu is already 0 or calculated by cooling curve of the exponential function. **Magnet8act** can be set via digital input or Magnet Control Word (**7.10**) and customized by parameter ConfMonMagnet8 **(65.24).** Internal name : OverloadMagnet8Accu **Int. Scaling: 1 == 1 % Type: SI**	0	300	100	%	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
Group 65	**Configuration Interface** **Magnet application** **All signals can be configured to either DIx or MagCW (7.10)**					
65.01	**ConfMagOn (configuration of MAGNET ON command)** Binary signal for **Cmd_MagOn** (written to **7.01 Bit 0**): 0 = **NotUsed** **Cmd_MagOn** OFF 1 = **On** **Cmd_MagOn** by rising edge (0 → 1) 2 = **DI1** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF 3 = **DI2** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF 4 = **DI3** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF 5 = **DI4** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF 6 = **DI5** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF 7 = **DI6** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF 8 = **DI7** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, default 9 = **DI8** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF 10 = **DI9** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, only available with digital extension board 11 = **DI10** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, only available with digital extension board 12 = **DI11** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, only available with digital extension board 13 = **DI12** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, only available with digital extension board 14 = **DI13** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, only available with digital extension board 15 = **DI14** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, only available with digital extension board 16 = **MagMCW Bit0** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 0 17 = **MagMCW Bit1** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 1 18 = **MagMCW Bit2** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MainCtrlWord (7.10)* bit 2 19 = **MagMCW Bit3** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 3 20 = **MagMCW Bit4** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 4 21 = **MagMCW Bit5** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 5 22 = **MagMCW Bit6** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 6 23 = **MagMCW Bit7** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 7 24 = **MagMCW Bit8** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 8					

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
	27 = **MagMCW Bit11** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 11 28 = **MagMCW Bit12** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 12 29 = **MagMCW Bit13** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 13 30 = **MagMCW Bit14** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 14 31 = **MagMCW Bit15** **Cmd_MagOn** by rising edge (0 → 1), 0 = **Cmd_MagOn** OFF, *MagCtrlWord (7.10)* bit 15 Int. Scaling: 1 == 1 Type: C Volatile: N Internal name : ConfMagOn					
65.02	**ConfEnbRun (configuration of enable MAGNET RUN command)** Binary signal for **Cmd_Run** (written to **7.01 Bit 3**): 0 … 31 **NOTE:** Please refer to parameter **65.01** for the complete configuration list 9 = **DI8** **Start** by rising edge (0 → 1), 0 = **Stop**, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfEnbRun	NotUsed	MagMCW Bit15	DI8	-	E
65.03	**ConfReset (configuration of RESET command)** Binary signal for **Cmd_Reset** (written to **7.01 Bit 7**): 0 … 31 **NOTE:** Please refer to parameter **65.01** for the complete configuration list 7 = **DI6** **Start** by rising edge (0 → 1), 0 = **Stop**, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfReset	NotUsed	MagMCW Bit15	DI6	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
65.04	**ConfEnbCC (configuration of ENABLE CURRENT CONTROL command)** Binary signal for **Cmd_Cur** (written to **7.01 Bit 14**): 0 = **NotUsed** **Cmd_Cur** is not active 1 = **On** **Cmd_Cur** is active 2 = **DI1** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active 3 = **DI2** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active 4 = **DI3** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active 5 = **DI4** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active 6 = **DI5** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, default 7 = **DI6** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active 8 = **DI7** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active 9 = **DI8** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active 10 = **DI9** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, only available with digital extension board 11 = **DI10** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, only available with digital extension board 12 = **DI11** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, only available with digital extension board 13 = **DI12** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, only available with digital extension board 14 = **DI13** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, only available with digital extension board 15 = **DI14** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, only available with digital extension board 16 = **MagMCW Bit0** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 0 17 = **MagMCW Bit1** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 1 18 = **MagMCW Bit2** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MainCtrlWord (7.10)* bit 2 19 = **MagMCW Bit3** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 3 20 = **MagMCW Bit4** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 4 21 = **MagMCW Bit5** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 5 22 = **MagMCW Bit6** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 6 23 = **MagMCW Bit7** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 7 24 = **MagMCW Bit8** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 8 25 = **MagMCW Bit9** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 9 26 = **MagMCW Bit10** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 10 27 = **MagMCW Bit11** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 11 28 = **MagMCW Bit12** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 12 29 = **MagMCW Bit13** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 13 30 = **MagMCW Bit14** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 14	NotUsed	MagMCW Bit15	DI5	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
	31 = **MagMCW Bit15** 1 = **Cmd_Cur** is active, 0 = **Cmd_Cur** is not active, *MagCtrlWord (7.10)* bit 15 Int. Scaling: 1 == 1 Type: C Volatile: N Internal name : ConfEnbCC					
65.05	**ConfDeMag (configuration of DEMAGNETIZATION command)** Binary signal for **Cmd_DeMag** (written to **7.01 Bit 13**): 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 5 = **DI4** 1 = **Cmd_DeMag** is active, 0 = **Cmd_DeMag** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfDeMag	NotUsed	MagMCW Bit15	DI4	-	E
65.06	**ConfRefBit0 (configuration of Bit0 selection command for internal references)** Binary signal for **IntRefBit0**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 2 = **DI1** 1 = **IntRefBit0** is active, 0 = **IntRefBit0** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfRefBit0	NotUsed	MagMCW Bit15	DI1	-	E
65.07	**ConfRefBit1 (configuration of Bit1 selection command for internal references)** Binary signal for **Cmd_IntRefBit1**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 3 = **DI2** 1 = **IntRefBit1** is active, 0 = **IntRefBit1** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfRefBit1	NotUsed	MagMCW Bit15	DI2	-	E
65.08	**ConfRefBit2 (configuration of Bit2 selection command for internal references)** Binary signal for **Cmd_IntRefBit2**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 4 = **DI3** 1 = **IntRefBit2** is active, 0 = **IntRefBit2** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfRefBit2	NotUsed	MagMCW Bit15	DI3	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
65.09	**ConfRefBit3 (configuration of Bit3 selection command for internal references)** Binary signal for **Cmd_IntRefBit3**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 16 = **MagMCW_Bit0** 1 = **IntRefBit3** is active, 0 = **IntRefBit3** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfRefBit3	NotUsed	MagMCW_Bit15	MagMCW_Bit0	-	E
65.10	**ConfPB_UP (configuration of PUSH BUTTON UP command)** Binary signal for **PB_UP**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 17 = **MagMCW_Bit1** 1 = **PB_UP** is active, 0 = **PB_UP** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfPB_UP	NotUsed	MagMCW_Bit15	MagMCW_Bit1	-	E
65.11	**ConfPB_DOWN (configuration of PUSH BUTTON DOWN command)** Binary signal for **PB_DOWN**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 18 = **MagMCW_Bit2** 1 = **PB_DOWN** is active, 0 = **PB_DOWN** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfPB_DOWN	NotUsed	MagMCW_Bit15	MagMCW_Bit2	-	E
65.12	**ConfPB_Reset (configuration of push button RESET command)** Binary signal for **PB_Reset**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 19 = **MagMCW_Bit3** 1 = **PB_Reset** is active, 0 = **PB_Reset** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfPB_Reset	NotUsed	MagMCW_Bit15	MagMCW_Bit3	-	E
65.13	**ConfStbyStRel (configuration of enable STEP BY STEP SHEET RELEASE command)** Binary signal for **StepbyStepRel**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 10 = **DI9** 1 = **StepbyStepRel** is active, 0 = **StepbyStepRel** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfStbyStRel	NotUsed	MagMCW_Bit15	DI9	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
65.14	**ConfTranspMode (configuration of enable TRANSPORT MODE command)** Binary signal for **TransportMode**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 11 = **DI10** 1 = **TransportMode** is active, 0 = **TransportMode** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfTranspMode	NotUsed	MagMCW_Bit15	DI10	-	E
65.15	**ConfBatOn (configuration of BATTERY ON command)** Binary signal for **Cmd_BatSel** (written to **7.01 Bit 11**): 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 22 = **MagMCW_Bit6** 1 = **Cmd_BatSel** is active, 0 = **Cmd_BatSel** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfBatOn	NotUsed	MagMCW_Bit15	MagMCW_Bit6	-	E
65.16	**ConfBatDisCh (configuration of BATTERY DISCHARGE command)** Binary signal for **Cmd_BatDis** (written to **7.01 Bit 12**): 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 23 = **MagMCW_Bit7** 1 = **Cmd_BatDis** is active, 0 = **Cmd_BatDis** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfBatDisCh	NotUsed	MagMCW_Bit15	MagMCW_Bit7	-	E
65.17	**ConfMonMagnet1 (configuration of enable MAGNET 1 I²t-MONITORING command)** Binary signal for **Magnet1act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 12 = **DI11** 1 = **Magnet1act** is active, 0 = **Magnet1act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet1	NotUsed	MagMCW_Bit15	DI11	-	E
65.18	**ConfMonMagnet2 (configuration of enable MAGNET 2 I²t-MONITORING command)** Binary signal for **Magnet2act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 13 = **DI12** 1 = **Magnet2act** is active, 0 = **Magnet2act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet2	NotUsed	MagMCW_Bit15	DI12	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
65.19	**ConfMonMagnet3 (configuration of enable MAGNET 3 I²t-MONITORING command)** Binary signal for **Magnet3act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 14 = **DI13** 1 = **Magnet3act** is active, 0 = **Magnet3act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet3	NotUsed	MagMCW_Bit15	DI13	-	E
65.20	**ConfMonMagnet4 (configuration of enable MAGNET 4 I²t-MONITORING command)** Binary signal for **Magnet4act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 15 = **DI14** 1 = **Magnet4act** is active, 0 = **Magnet4act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet4	NotUsed	MagMCW_Bit15	DI14	-	E
65.21	**ConfMonMagnet5 (configuration of enable MAGNET 5 I²t-MONITORING command)** Binary signal for **Magnet5act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 28 = **MagMCW_Bit12** 1 = **Magnet5act** is active, 0 = **Magnet5act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet5	NotUsed	MagMCW_Bit15	MagMCW_Bit12	-	E
65.22	**ConfMonMagnet6 (configuration of enable MAGNET 6 I²t-MONITORING command)** Binary signal for **Magnet6act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 29 = **MagMCW_Bit13** 1 = **Magnet6act** is active, 0 = **Magnet6act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet6	NotUsed	MagMCW_Bit15	MagMCW_Bit13	-	E
65.23	**ConfMonMagnet7 (configuration of enable MAGNET 7 I²t-MONITORING command)** Binary signal for **Magnet7act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 30 = **MagMCW_Bit14** 1 = **Magnet7act** is active, 0 = **Magnet7act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet7	NotUsed	MagMCW_Bit15	MagMCW_Bit14	-	E

Index	Signal / Parameter name	min.	max.	def.	unit	E/C
65.24	**ConfMonMagnet8 (configuration of enable MAGNET 8 I²t-MONITORING command)** Binary signal for **Magnet8act**: 0 … 31 **NOTE:** Please refer to parameter **65.04** for the complete configuration list 31 = **MagMCW_Bit15** 1 = **Magnet8act** is active, 0 = **Magnet8act** is not active, default Int. Scaling: 1 == 1 Type: C Volatile: N Internal name: ConfMonMagnet8	NotUsed	MagMCW_Bit15	MagMCW_Bit15	-	E

Fault-Alarm-Text

Magnet application

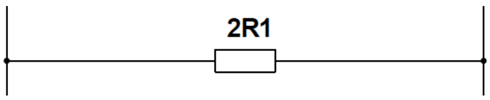
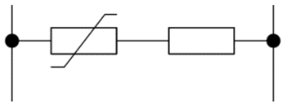
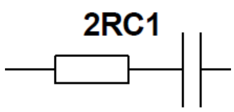
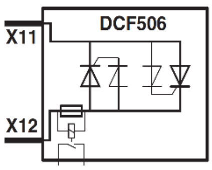
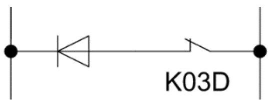
Group 69

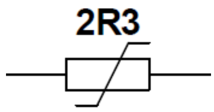
Index	Signal / Parameter Name	min.	max.	Def.	unit	E/C
69.01	**Faults (parameter for all user fault texts)** **reserved** Internal name : Txt_Faults **Type: C**	Faulttext 1	Faulttext X	Faulttext 1	-	E
69.02	**Alarms (parameter for all user alarm texts)** The alarm texts implemented are: **Name** **Description** **Message** Alarm 310: ParSwiBlock → A310 Alarm 311: M_Undervoltg → A311 Alarm 312: ResistorHot → A312 Alarm 313: ResistorCold → A313 Alarm 314: Magnet1Ovrld → A314 Alarm 315: Magnet2Ovrld → A315 Alarm 316: Magnet3Ovrld, → A316 Alarm 317: Magnet4Ovrld → A317 Alarm 318: Magnet5Ovrld → A318 Alarm 319: Magnet6Ovrld → A319 Alarm 320: Magnet7Ovrld → A320 Alarm 321: Magnet8Ovrld → A321 Internal name : Txt_Alarms **Type: C**	ParSwiBlock	Magnet8Ovrld	ParSwiBlock	-	E
69.03	**Notices (parameter for all user notice texts)** **reserved** Internal name : Txt_Notice **Type: C**	Noticetext 1	Noticetext X	Noticetext 1	-	E

Appendix C - Overvoltage Protection Hints

Reduction of switch-off overvoltage and spark quenching

A magnet is a large inductance which means that great attention must be paid to the protection concept. A DC electromagnet has an inductance that causes, especially with larger magnets, high negative switch-off voltages. This might lead on to disruption of the electric isolation and destruction of sensible electronic components of the customers electronic control interface.
The following measures have to be taken into account to damp the voltage spikes. But a damping of the switch-off peak is always a compromise between the fall time of the armature and the lifetime of the electronic and switches in the periphery.

OV1 (possibilities) ▪ **Resistor**	+ Overvoltage reduction - Losses due to heating 
▪ **MOV + resistor**	+ OV reduction 
▪ **RC snubber**	+ Voltage limitation at switching contacts 
▪ **DCF506**	+ product existing / - no battery back-up possible 
Diode + contact	+ prevent OV through current bridge 1 - contact must be opened through current bridge 2 

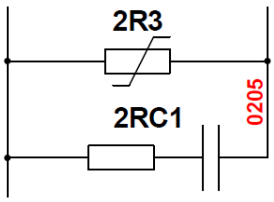
MOV (**M**etal **O**xid **V**aristor)	directly in parallel of each magnet 

Damping through ohmic Resistor
A parallel resistor limits the switch-off voltage. Thus the fall time of the armature current and the electric energy demand increases. The switch-off voltage decreases if the parallel resistor is reduced.

Damping through Diodes and Zener Diodes
To prevent trouble it is recommended to use a diode for decoupling.
With closed contactors current bridge 2 should be blocked. When selecting the diodes make sure that these diodes are able to block the operation voltage and that they are able to stand the rated current of the connected electromagnet for a short time in forward direction. The fall of the armature current in this circuit is delayed as well. In these circuits diodes with Avalanche-conduction are very reliable.

Damping through varistors (voltage dependent resistors)
To damp switch-off voltages also varistors are used. The electric energy demand increases only slightly and the fall time of the armature current is not delayed significantly. Thus the switch-off voltage is damped substantially.

Spark Quenching
The high switch-off voltage especially of larger DC electromagnets causes electric arcs at the used switches and thus burning down contacts and electro migration if no spark quenching components are installed. The most common method for spark quenching is realized through a varistor and a RC element.



With the varistor the switch-off voltage is damped onto the peak voltage of the used capacitor. The RC element connected in parallel to the switching contact causes that the occurring voltage at the contact does not exceed the minimum voltage needed for an electric arc. Thus an electric arc is surely avoided.

Appendix D - Additional Technical Information

1. Determination of Magnet Inductance

To determine the needed number of additional single firing pulses (reversal delay) and dimension of the overvoltage protection on the DC side of the DCS800 for high inductance loads the inductance of the magnet is needed.
To determine the load inductance using a trace monitor do the following:
Evaluate the linear part at the beginning of the curve.
Formal connectedness:
Take following differential equation: $U - i * R - L * di / dt = 0$
For the linear part of the current slope is valid: $(U - i * R) * \Delta t / \Delta i = L$

<u>Example with Uact [%] and Iact [%] taken as measured percentage values of the output voltage and current from a trace curve:</u>
Ua = Usupply * 1.35 * Uact [%], with Uact [%] = 0.655 => 65.5% →
Ua = 280 * 1.35 * 0.655 = 248 V
ia = IN * Iact [%] with IN = 105 A and Iact [%] = 0,2831 => 28,31% →
ia = 105 * 0.2831 = 29.7 A
Because of the linear current slope from i = 0 to i after Δt the (i after Δt) / 2 can be taken for i of the i * R decrease.
R was measured to 2.3 Ω at the end of the magnetization process when the current has reached finally a linear behavior.
With Uact [%] = 0.37 => 37 % and Iact [%] = 0.579 => 57.9 %;
R = (280 * 1.35 * 0.37) / (105 * 0.579) = 2.30 Ω

.
With Δt = 1 s ’ L = (248 – 29.7 / 2 * 2.30) * 1 / 29.7 = 7.20 H

2. Number of single firing pulses / Calculation of the Reversal Delay Time

Despite a maximum firing angle (full opposite voltage value for current reduction in the inductance) due to the high inductance loads it takes a long time until the current has been reduced down to zero. Especially in 4-Q operation it is essential that the current is zero and the active thyristor is safely blocked before the change of the torque direction (firing of the antiparallel bridge for current reversal) is initiated. If the antiparallel thyristor bridge is fired before the previous is safely blocked circulating currents will blow fuses.
Lift magnets normally have inductance values from 10 H or above. This makes it essential after status signal zero current is active to fire a determinate number of single firing pulses until the current has reached zero.
Beside the determination of the number of single firing pulses a calculated verification is needed. Most of all to consider an operational existing power supply under voltage or with rated currents > 60 A the resolution of the current actual-value acquisition applied to the holding current of the thyristors (approx. 100 mA).

<u>Calculation example:</u>
$U = L * \Delta i / \Delta t$; $\Delta t = L * \Delta i / U$
U = DCS800 output voltage at power supply under voltage level
and α: U = P99.10 * (1+ P30.23 / 100) * 1.35 * cos(α)
Δi = 1 % of the converter DC current in parameter 97.02
From zero current detection (1 % of 97.02) additional single firing pulses are applied.
Δt = minimum time of single firing pulses,
1 Impulse = 3.33 ms at 50 Hz, resp. 2.78 ms at 60 Hz

Example:
L = 1 H, P99.10 = 400 V (nominal AC mains voltage);
U = P99.10 * (1+ P30.23 / 100) * 1.35 * cos (α)
P30.23 = -30 % (mains voltage minimum), Δi = P97.02 * 0.01
P97.02 = 1200 A (converter rated DC current), ArmAlphaMax = 150° (P20.14)
Δt = 1 * 12 / [400 * (1 + (-30) / 100) * 1.35 * 0.866] = 0.037 s
Minimum number of additional single firing impulses at
50 Hz = 37 ms / 3.33 ms = 12
20 % allowance = 12 * 1.2 = 14.4 → The reversal delay time should be set to
43.14 = 50 ms (RevDly), the **97.19** = 200 ms (ZeroCurTimeOut).

3. Dimensioning of Overvoltage Protection

The **magnetic conservation of energy** within the magnet field windings for dimensioning of the overvoltage protection can be calculated with the inductance value of the magnet windings:

$$W = L * \frac{I_{mag}^2}{2} \qquad R_{mag} = \frac{U_{mag}}{I_{mag}} \qquad L = \frac{2*W}{I_{mag}^2}$$

W	magnetic energy in watt-seconds [Ws]
L	inductance value of the magnet field windings in Henry [H]
Imag	rated magnet current in Ampere (see nameplate magnet) [A]
Rmag	resistance in Ohm [Ω]
Umag	rated magnet voltage in Volt (see nameplate magnet) [V]

The time constant ***τ*F** of a possible needed **freewheeling circuit** can be calculated to

$$T_F = \frac{L}{R}$$

L	inductance value of the magnet field windings [H]
R	resulting resistance of magnet field windings, cabling, dropping resistor (if needed) [Ω]
τF	time constant [s]

Damping Resistor Rs (Dimensioning of B6C bridge):

$$R_S[\Omega] \leq \frac{1.35 x U_L[V]}{0.5[A]}$$

$$P_V[W] = 2...3* \frac{U_{Nmag}^2[V]}{R_s[\Omega]}$$

UL	line to line voltage on the AC connection of the converter [V]
PV	power loss of Rs [W]
UNmag	magnet rated voltage [V]

DCS family

DCS550-S modules
The **compact** drive for **machinery application**

20 … 1,000 A_{DC}
0 … 610 V_{DC}
230 … 525 V_{AC}
IP00

- Compact
- Robust design
- Adaptive and winder program
- High field exciter current

DCS800-S modules
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20 … 5,200 A_{DC}
0 … 1,160 V_{DC}
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- Compact
- Highest power ability
- Simple operation
- Comfortable assistants, e.g. for commissioning or fault tracing
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DCS800-A enclosed converters
Complete drive solutions

20 … 20,000 A_{DC}
0 … 1,500 V_{DC}
230 … 1,200 V_{AC}
IP21 – IP54

- Individually adaptable to customer requirements
- User-defined accessories like external PLC or automation systems can be included
- High power solutions in 6- and 12-pulse up to 20,000 A, 1,500 V
- In accordance to usual standards
- Individually factory load tested
- Detailed documentation

DCS800-E series
Pre-assembled drive-kits

20 … 2,000 A_{DC}
0 … 700 V_{DC}
230 … 600 V_{AC}
IP00

- DCS800 module with all necessary accessories mounted and fully cabled on a panel
- Very fast installation and commissioning
- Squeezes shut-down-times in revamp projects to a minimum
- Fits into Rittal cabinets
- Compact version up to 450 A and Vario version up to 2,000 A

DCS800-R Rebuild Kit
Digital control-kit for existing powerstacks

20 … 20,000 A_{DC}
0 … 1,160 V_{DC}
230 … 1,200 V_{AC}
IP00

- Proven long life components are re-used, such as power stacks, (main) contactors, cabinets and cabling / busbars, cooling systems
- Use of up-to-date communication facilities
- Increase of production and quality
- Very cost-effective solution
- Open Rebuild Kits for nearly all existing DC drives
- tailor-made solutions for…
  - BBC PxD
  - BBC SZxD
  - ASEA Tyrak
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Ident. No.: 3ADW000430 R0201 Rev B
01_2015

430R0201A5040000