



Product catalogue 2026



Industrial Solutions

Version 2026-04



Imprint

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Content

Introduction

Group	6
Overview of medium-frequency systems	7
Overview of mains frequency systems	8
Overview of uses	9

Genius product series

Basic (BAS) function package	14
Professional (PRO) function scope	15
Seam (SEAM) function Scope	16
Comparison of BAS and PRO functions	17
Inspectoren	18
Optionen	25
IQR - integrated quality control	26
IQFlex - Integrated Quality Control incl. Q-/IQ-Inspector & IQR	27
PQS-ready – preparation for PQS licence	30
XPQS – The new dimension of process monitoring	31
PDD - Process Data Documentation	32
TT - Trace Tag	33
ALU Mode – Classic / AMC + Dynamic Conditioning Mode / DCM	34
BD component trace	35
HSC High Speed Current	36
Master-Slave systems	37
Multi Measurement 1 (MM1)	38
Multi Measurement 2 (MM2)	39
GeniusHWI product code	40
Using the product code	42
Product codes for weld enclosures	43

PC operating software

XPegasus Silver	51
XPegasus Gold	53
XPegasus Platinum	55
XPegasus Platinum compact	56
XPegasus Platinum OPC-(UA)	57
Xcomand2.1 - success with "touch"!	58
Comparison of XPegasus models	59
XPegasus XLab - Process transfer from laboratory to production - Lab2Fab	60

Filius product series

Operation	64
Technology selection	65
Classic function scope	66
Multi function scope	67
Mono function scope	68
Model comparison	69
Filius product codes	70
Filius Adapter	72

MFP power units (Filius)

MFP product code / order designation	75
--	----

Sinius product series

System structure	78
Comparison of functions	79
SiniusHWI inverters	80
SiniusAC	83
Sinius product code	84

AnalogHWI product series

AnalogHWI product code / order designation	91
--	----

SlaveHWI product series

GeniusHWI slave operation	93
SiniusHWI slave operation	94
SlaveHWI product code	95

Weld transformers

Recommendations	98
Welding transformer accessories	102

Mains frequency systems

GeniusACS	104
Comparison of Spot and PRJ functions	107
Produktschlüssel GeniusACS	108
Ratia43/73 and MPK43/73 product series	109
Ratia73 product series	110
Ratia73 product codes	111
Ratia43α product series	112
Ratia43 product codes	113
MPS10 product series	116

50/60 Hz Power stages

LE11	118
LE100 / LE200	119
LE7/1	121

LE10/3	122	Limit value chart 3x40W	168
LE20	123	Limit value chart 3x45W	169
LE20/3	124	Limit value chart 3x60W	170
Weld panels		Limit value chart LE-L45A	171
Control cabinets	126	Limit value chart LE-125A	172
Top mounted robot cabinets	127	Limit value chart LE-L200A	173
Floor-standing cabinets	128	Limit value chart LE-580A	174
Control cabinet solution for projection welding applications	128	Limit value chart LE-1135A	175
Control cabinet options	130	Limit value chart LE-700A	176
		Limit value chart LE-900A	177
Accessories		Limit value chart LE-1440A	178
Current and force measuring device TE1700C ...	133	Limit value chart LE-2335A	179
Distance measurement	138	Limit value chart LE-2950A	180
Netzlastbegrenzungssteuerung	139	Limit value chart LE-3700A	181
Transformer switchover	140		
HWC-ETH module	141		
PQS licence	143		
QUADRIGO-Master	144		
QUADRIGO-VISU	144		
Academy			
Basic training	146		
Advanced training	147		
Basic + advanced training	148		
Maintenance training	149		
Expert training	150		
Key user training	151		
Services			
Appendix - technical data			
Limit value chart x03L	154		
Limit value chart x03W	155		
Limit value chart x06L	156		
Limit value chart x06W	157		
Limit value chart x08L	158		
Limit value chart x08W	159		
Limit value chart x13L	160		
Limit value chart x13W	161		
Limit value chart x16L	162		
Limit value chart x16W	163		
Limit value chart x24W	164		
Limit value chart x36W	165		
Limit value chart 2x24W	166		
Limit value chart 2x32W	167		

Introduction

For over seven decades, Harms & Wende has been specialised in all resistance pressure and friction welding procedures, from services to products.

Our control and regulation technology solutions enjoy an outstanding reputation around the world. A number of awards and certificates demonstrate the high quality of our products. We are particularly delighted to have once again been selected as one of the winners of the "Germany's customer champions" competition. Thanks to the innovations which arise in our research and development department, we are always at the cutting edge of a constantly changing industry. Our experience enables us to offer our customers individual and solution-oriented products.

We create trust, because trust binds.

HARMS+WENDE GROUP



The Harms+Wende Group - top together!

The challenges of the global markets are diverse, but each one is very specific. Harms & Wende has responded precisely to this by forming the Harms & Wende Group and has compiled an appropriate team of specialists for each task. We have brought unique skills together under the Group structure, particularly in the area of joining technologies. Our priority is maximum customer satisfaction, which we achieve by means of the necessary product and process quality as well as individually adapted solutions. By continuously evolving our products, always on tried-and-tested platforms, we achieve both technology and quality leadership in our area of specialisation. We therefore present ourselves to you as the perfect partner, together. Whether for complete control systems for resistance pressure welding, quality management systems or automation solutions, we offer you profound knowledge and extensive services.

We are the right connection.



Process technologies focusing on resistance and friction welding

www.harms-wende.de



PROCON PAS Process automation for selected technologies

www.procon-pas.de



Process quality management for joining technologies

www.hwh-qst.de

Overview of medium-frequency systems

Basic information on the medium-frequency systems

General scope	GeniusHWI	FiliusMFS + MFP	SiniusHWI
Illustrations			
Uses	Integrators, mechanical engineering, special integrators		
Operating concepts	Inverter series with networked operating software	Parameterisation in the control system (stand-alone)	Operation via PLC
No. of schedules	256-512	8-128, 2x16	Internal 8
Weld profile	Pre-, Main-, Postweld	Pre-, Main-, Postweld	Flexible
Regulation	KSR, IQR	KSR	KSR
Monitoring	Limit value monitoring, envelope, displacement monitoring, distance measurement	Limit value monitoring, distance measurement	Via PLC, externally with PQSweld
Analysis functions	Current, voltage, resistance curve,...		Via PLC
Machine connection	24 V I/O, field bus systems	24 V I/O	24 V I/O, field bus systems
Electrode management	Pre-warning, electrode wear, stepper function, milling function	Pre-warning, electrode wear, stepper function	Via PLC
Valves	1 proportional valve Output 0-10V, 1 solenoid valve	2 proportional valves Output 0-10V, 2 solenoid valves, 1 pre-stroke valve	Via PLC
Mains voltage supply	400 - 440 V, 480 V		
Max. output current	200 A - 3500 A	200 A - 2400 A	200 A - 3500 A




Overview of mains frequency systems





Basic information on the mains frequency systems




General scope	GeniusACS	Sinius	MPS10	FiliusAC	Ratio43	Ratio73
Illustrations						
No. of schedules	256, 512	8 internal	8	8, 32, 128	128	128
Number of start inputs	1, 2	1	2	1, 2	2	2
Number of ignition outputs	1, 3	1, 3	1	1	1, 3	1, 3
Mains frequency	50 Hz / 60 Hz automatically					
Operation	XPegasus	With PLC	Integrated	Integrated	Integrated	XPegasus
Current regulation	1- and 3-phases	1-phase	1-phase	1-phase	1- and 3-phases	
Current monitoring	Yes	With PLC	No	Yes	1- and 3-phases	
Regulation range monitoring	Yes	No	No	Yes	Yes	Yes
Current profiles	3	80	1	3	3, [10 optional]	
valve outputs	2	None	2	1, 2	2	
Proportional valve outputs	Yes	1	No	1, 2	1	
Pressure program	Yes	No	No	Yes	Yes	
Time setting	Per	Per, half cyc.	Per, half cyc.	Per, half cyc., ms	Per, half cyc.	
Spot counter / counter groups	128	No	No	1, 2	128	
Stepper function	No	No	No	Yes	Yes	
Data communication	EtherNet	Yes	No	No	RS422	RS422, Ethernet
Bus communication	EA, PNSe, ECT, EIP, DEV, CAN	CAN, PBS, ECT, PNie, EIP	No	No	24 V I/O	PBS, IBSe, IBSO
Spot welding modes	Single spot, serial spot					
Seam welding mode	No	Yes	No	Yes	Yes	Yes
Data backup	With XPegasus	No	No	Via USB	With XPegasus	

Overview of uses

Due to their characteristics, the different weld timer families are designed for specific systems or machines. Harms & Wende provides for three groups of possible uses here.

Modular weld timer system network – individual workstation with Windows-based visualisation.			
GeniusHWI	Ratia73	GeniusACS	
MF	AC	AC	
			

Modular weld system – individual workstation with integrated weld timer system and decentralised operation on the machine			
GeniusHWI/Xcomand2	FiliusACS/FiliusMFS	Ratia43	MPS10
MF	MF / AC	AC	AC
			

Complete automation solution with PLC-based visualisation systems and functions			
SiniusACS/SiniusHWI	FiliusXXX analogue	LE20	
MF / AC	MF / AC	AC	
			

Genius product series



Fig. 2-1 *Genius HWI* inverters



Fig. 2-2 *Genius HWI 3xy* inverters

Description

The *Genius* series inverters consist of a medium-frequency power unit with an integrated modular control system. The Plug-in card rack is intended for several plug-in modules.

The CPU and as i. e. weld board for the basis of the Genius inverters. Further functions such as e.g. fieldbus cards or I/O cards make this device highly adaptable. The various IQR, PQSweld and process management software packages also enable this system to be extended very flexible. Even the system's basic equipment includes visualisation of the last ten resistance, current and voltage curves.

Operating concepts

Central operation of up to 60 Inverter systems with the **X**Pegasus operating software via Ethernet. (**X**Pegasus subject to be purchased separately).

Decentralised operation of one inverter system with **X**Comand (not included in the delivery scope).

Machine and robot connection

As standard, communication with the machine or robot controller system takes place via the 24 V I/O. For an optional fieldbus connection, you can choose from eight fieldbus variants.



GeniusHWI403-416



GeniusHWI424-436

GeniusHWI403-436

Power classes	HWIx03L	HWIx03W	HWIx06L	HWIx06W	HWIx08L	HWIx08W
Mains supply voltage	4= 400 V / 440 V 3 ph, 5= 480 V 3 ph					
Maximum output current	250 A	250 A	500 A	500 A	650 A	650 A
Output current @ 20% ED	84 A	112 A	157 A	224 A	302 A	302 A
Output current @ 100% ED	38 A	50 A	70 A	100 A	135 A	150 A
Rated power @ 20% ED	42 kVA	56 kVA	79 kVA	112 kVA	151 kVA	168 kVA
Cooling Media	Air	Water	Air	Water	Air	Water
Gross weight	ca. 27 kg	ca. 21 kg	ca. 27 kg	ca. 21 kg	ca. 27 kg	ca. 21 kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L

Power classes	HWIx13L	HWIx13W	HWIx16L	HWIx16W	HWIx24W	HWIx36W
Mains supply voltage	4= 400 V / 440 V 3 ph, 5= 480 V 3 ph					
Maximum output current	900 A	900 A	1200 A	1200 A	1600 A	2400 A
Output current @ 20% ED	335 A	369 A	447 A	537 A	783 A	1062 A
Output current @ 100% ED	150 A	165 A	200 A	240 A	350 A	475 A
Rated power @ 20% ED	168 kVA	185 kVA	224 kVA	269 kVA	392 kVA	531 kVA
Cooling Media	Air	Water	Air	Water	Air	Water
Gross weight	30 kg	24 kg	30 kg	24 kg	26 kg	26 kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	4 l/min 1 gal./ L	4 l/min 1 gal./ L

GeniusHWI440 - GeniusHWI460



GeniusHWI440-460

Power classes	HWI3x40W	HWI3x45W	HWI3x60W
Mains supply voltage	4= 400 V / 440 V 3 ph, 5= 480 V 3 ph		
Maximum output current	2950 A	3500 A	3500 A
Output current @ 20% ED	1733 A	1845 A	2571 A
Output current @ 100% ED	775 A	825 A	1286 A
Rated power @ 20% ED	867 kVA	923 kVA	1286 kVA
Cooling Media	Water		
Gross weight	75 kg	75 kg	75 kg
Cooling water requirement	6 L/min 1,5 gal./ L	6 L/min 1,5 gal./ L	8 L/min 2 gal./ L

Basic (BAS) function package

The *GeniusHVI* function package Basic (BAS) offers tailored functions in spot and projection welding for your standard machines.

Its basic equipment encompasses 24 V I/Os and an analog output to a proportional valve. Secondary current regulation, limit value monitoring and S-Inspector (distance) are part of the basic equipment.

Electrode management and proportional valve control are, of course, also included. As standard, the inverters are equipped with an Ethernet interface, enabling you to network all devices.

Standard function scope

- 256 schedules
- 3 main current times (pre-heating, main, post heat time) ISO weld scheme
- Digital 24 V I/O
- Secondary constant current regulation (KSR)
- Electrode management
- Current Upslope, current downslope
- Pulses
- Proportional valve output 0-10 V
- Current limit value monitoring
- Visualisation of measured data through XPegasus
- Further interfaces, see options and equipment: "[Function pack](#)" auf Seite 40 and "[Machine and robot connections](#)" auf Seite 85.

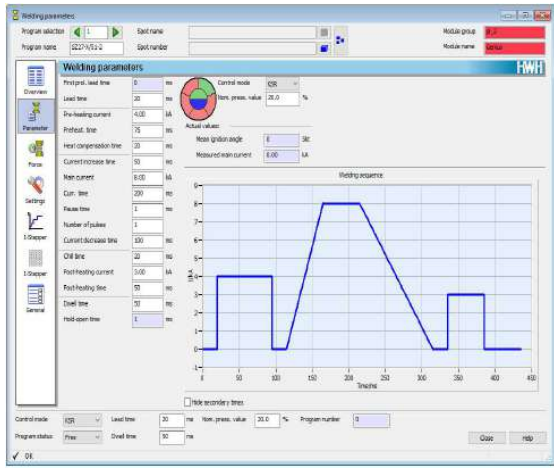


Fig. 2-3 Current parameters on the XPegasus user interface

S-Inspector (distance)

- Component control
- Sink-in distance
- Final dimension



Fig. 2-4 Settings for the distance inspector via the XPegasus user interface

NEW I-Inspector (Current)

- Limit value
- Mean envelope value
- Reference envelope value



Fig. 2-5 GeniusHVI416W (with 24 V I/O)

Professional (PRO) function scope

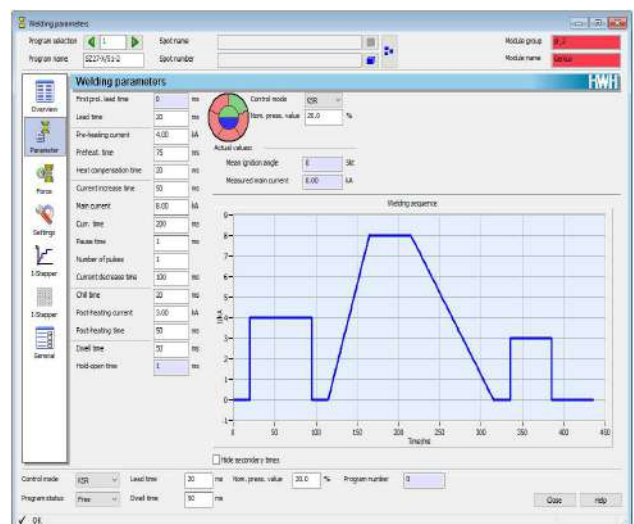
Dedicated usage: For spot and projection welding with extended function scope.

The *GeniusHVI* product range offers maximum functionality and flexibility. The "PRO" version is the professional for all mechanical engineering welding tasks. Its basic equipment encompasses 24 V I/Os and one analogue output for the proportional valve plus 512 schedules.

The function pack of the Inverter professional encompasses secondary current regulation, control stroke inspector and distance inspector as well as visualisation of the current, voltage and resistance curves of the last ten welding operations. We have additionally integrated the inspectors for current, voltage and resistance into the Professional equipment. At the same time, it can also be prepared for our PQSweld system. Electrode management and proportional valve control are, of course, also included. Communication to external systems is possible via the I/O level, Profibus, Profinet or via eight further bus interfaces. As standard, the inverters are equipped with an Ethernet interface, enabling you to network all devices.

Standard function scope

- 512 schedules
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/Os
- Constant current regulation (KSR)
- **NEW** Voltage and power control included as standard
- Electrode management
- Current Upslope, current Downslope
- Pulses
- Proportional valve output 0-10 V
- Current limit value monitoring
- Further interfaces, see options and equipment: "[Function pack](#)" auf Seite 40 and "[Machine and robot connections](#)" auf Seite 85.



Stromparameter in der XPEGASUS-Bedienoberfläche

H-inspector (control stroke)

- Limit value
- Mean envelope value
- Reference envelope value

R-inspector (resistance)

- Limit value
- Mean envelope value
- Reference envelope value

S-Inspector (distance)

- Component control
- Sink-in distance
- Final dimension

I-Inspector (current)

- Limit value
- Mean envelope value
- Reference envelope value

U-Inspector (voltage)

- Limit value
- Mean envelope value
- Reference envelope value

Seam (SEAM) function Scope

The "GeniusHWI-SEAM" inverter is the specialist for roll spot applications. The user has 16 profiles available for the seam welding process. The profiles run sequentially, and the user can decide for himself whether the specified time duration is welded to completion or whether the welded profile is terminated prematurely via an external input and the next profile is welded. For control purposes, a handshake signal is exchanged via the fieldbus. With this extensive welding profiles individual adaptations of the welding process for the respective task are possible. Welds up to seven seconds are made with secondary current regulation while for longer weld times primary current regulation is required

Standard function scope

- 512 schedules
- 16 weld profile
- Digital 24 V I/Os
- Constant current regulation (KSR)
- Proportional valve output 0-10V
- Visualisation of measured data
- Further interfaces, see options and equipment: "[Function pack](#)" auf Seite 40 and "[Machine and robot connections](#)" auf Seite 85.



Each of the 16 current profiles consists of the following parameters:

- SAZ current increase time
- Current_A current in A depending on the control mode
- Current_SKT current in SKT depending on the control mode
- SZ main current time in ms
- PZ pause time in ms
- Pulses number of pulses
- Pause current in ms
- Control value preset profile value or external
- Monitoring -off, I-mean value, SKT-mean value
- Blanking time
- Measuring time
- Tolerance+
- Tolerance-
- Deviation window
- Reference value kA or SKT

GeniusHWI Seam Accessories

Designation	Article no.	Description	
PSM1-0600A	47794	Signal converter box primary current measurement, measuring range 600 A (GeniusHWIx03 - GeniusHWIx08)	<p>1 Messbox PSM1 2 HTA-Strömsensor (HTA 200-S oder HTA 400-S)</p>
PSM1-1000A	47794	Signal converter box primary current measurement, measuring range 1000 A (GeniusHWIx13 - GeniusHWIx36)	
PSM1-2500A	47794	Signal converter box primary current measurement, measuring range 2500 A (GeniusHWI3x40 - GeniusHWI3x60)	

Primary current measurement is required for welding tasks with a welding time ≥ 7 sec.

Comparison of BAS and PRO functions

Function scope	GeniusHWI BAS	GeniusHWI PRO
Operating concepts	PC with XPegasus operating software	
Programs	256	512
Current times	3 times, pre, main, post current time	
Current upslope	Yes	
Current downslope	Yes	
Pulses	Yes	
Robot and machine connection	various fieldbus interfaces	
Electrode management	Yes	
1 proportional valve	Yes	
Visualisation of the last 10 measured data	Yes	
Secondary current regulation KSR	Yes	
Current limit value monitoring	Yes	
S-Inspector (component contact, sink-in distance, final dimension monitoring)	Yes	
I-Inspector (current envelope)	Yes	
U-Inspector (voltage envelope)	No	Yes
H-Inspector (control stroke envelope)	No	Yes
R-Inspector (resistance)	No	Yes
IQR - adaptive feedback weld pack for steel materials	Optional	
Q-Inspector (Quality inspector)	Optional	
PQS (PQS-ready)	Optional	
AMC / DCM - ALU Mode Classic + Dynamic Conditioning Mode	Optional	
BD - component documentation	Optional	
PDD - Process Data Documentation	Optional	
TT - Trace Tag	Optional	
HSC - High Speed Current	Optional	
IQflex - Integrated Quality Control incl. IQ-Inspector & IQR	optional	
MM1-Multi-Mess 1	optional	
MM2-Multi-Mess 2	optional	
MASTER (for master slave systems)	optional	

Inspectoren

monitoring functions

Inspectors are parameter monitoring functions allowing to verify if they appear in a certain tolerance band. Depending on the model purchased different inspectors are available. Inspectors installed are visible in XPe-gasus interface.

The following inspectors are available:

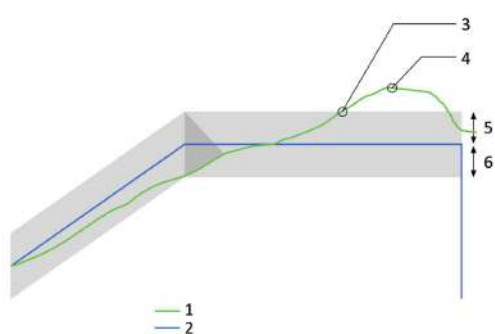


Fig. 2-6 Envelope with absolute tolerance

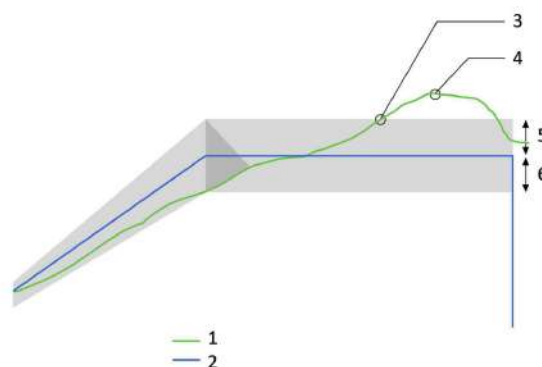


Fig. 2-7 Envelope with relative tolerance

- 1 Measured value curve
- 2 Reference curve
- 3 Tolerance band
- 4 Measured value outside of the tolerance
- 5 Positive, permissible tolerance deviation
- 6 Negative, permissible tolerance deviation

The following inspectors are available:

- Current: I-Inspector and limit monitoring
- Voltage: U-Inspector
- Resistance: R-Inspector
- Force: F-Inspector
- Control stroke: H-Inspector
- Quality: Q-Inspector
- Component control and distance measurement: S-Inspector
- expulsion: SP-Inspector

I-Inspector (current)

Monitoring the current curve value during an ongoing weld (in-line) provides information about the magnitude of the current intensity and the constant quality of the weld achieved as a result.

This monitoring is very useful in the case of unregulated current input, since any change in the resistance of the weld metal is immediately visible in the current curve.

The energy density available during welding and the amount of energy introduced into the weld essentially determine the weld joint. Therefore, monitoring the current profile of a weld allows a statement to be made about the constant current intensity and the quality of the weld achieved as a result. The current curve is the direct feedback from the inverter from values sensed.

Fig. 2-8 *XPegasus* screenshot showing the I Inspector

Applications:

- Spot welding with non regulated current
- Projection weld with non regulated current

Monitoring methods:

- Mean value monitoring to setpoint or reference value source.
- Envelope monitoring to setpoint or reference value source.

U-Inspector (voltage)

The use of voltage measurement is recommended for applications with constant current control in spot or projection welding systems. Since the control works very fast, in the millisecond range, hardly any change in the current curve can be detected. However, a greater dynamic can be seen in the voltage curve.

To be able to monitor the voltage a cable must be wired to the secondary side of the transformer. If the dynamics of the voltage curve increases due to changes in the welding resistance in the weld metal, this can be an indication of a change in the weld metal or a change in the system condition, e.g. a change in the pressing force.

Fig. 2-9 *X*Pegasus representation with open U-Inspector settings

Applications:

- Spot welding in controlled mode (KSR)
- Projection welding in controlled mode (KSR).

Monitoring methods:

- Average value monitoring to setpoint or reference value source.
- Envelope monitoring to setpoint or reference value source.

R-Inspector

We recommend to use the R-Inspector for spot applications e.g. for the control of electrode cap milling.

The R-Inspector compares the resistance curve during welding with a reference curve and issues a warning if a pre-selected tolerance is exceeded or classifies the weld as faulty. To monitor the resistance curve, voltage measurement must be connected to the electrodes.

The reference curve can be formed from the preset values of the controller or from the measured values of a weld classified as good.

The reference of a good weld can be specified as envelope curves. The +/--tolerance can be specified with a constant or a proportional distance to the reference curve.

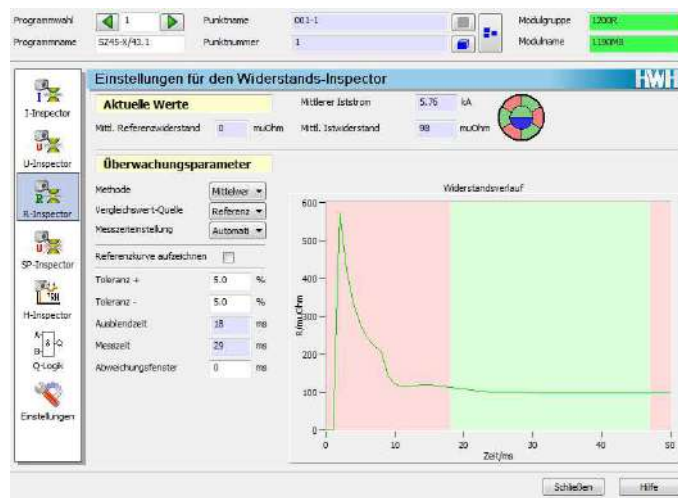


Fig. 2-10 XPEGASUS representation with open R-Inspector settings

Applications:

- Spot welding in set or controlled mode.
- Monitoring whether cap milling has occurred.

Monitoring methods:

- Mean value monitoring to setpoint or reference value source.
- Envelope monitoring on setpoint or reference value source.

H-Inspector (control stroke)

Represent an alternative to voltage measurement. Here, the change of the control value (pulse width) is considered.

Constant current regulation keeps the weld current on a user selected set value independent of changing weld conditions.

TA bandwidth of changes of the regulator value are an indication of the process stability. Exceeding the set tolerance band will lead to a warning and an indication of a bad weld. The H-Inspector compares the changes in the actuating value during welding with a reference curve and, if a preselected tolerance is exceeded, issues a warning or classifies the weld as faulty.

The reference of a weld can be selected as envelope curves. The +/- tolerance can be specified with a constant or a proportional distance to the reference curve.

We recommend using the H-Inspector for projection weld applications.

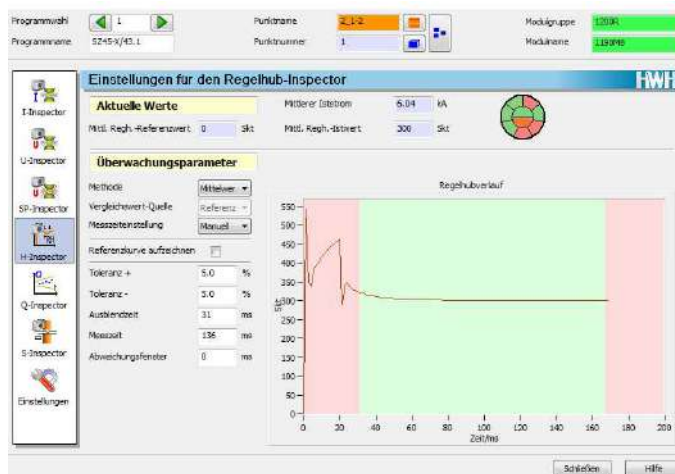


Fig. 2-11 X-Pegasus representation with open H-Inspector settings

Applications:

- Spot welding in controlled mode (KSR)
- Projection welding in controlled mode (KSR).

Monitoring methods:

- Average value monitoring to setpoint or reference value source.
- Envelope monitoring to setpoint or reference value source.

Q-Inspector (quality inspector)

The Q-Inspector compares the dynamic resistance curve of a weld with a previously recorded reference and evaluates the similarity.

Particular attention is paid here to the simplicity of operation.

The reference is determined from real welds and thus represents an optimized resistance curve. This reference is given a value of 1 (100%). Each subsequent weld is evaluated in its similarity using an internal algorithm. This value is called "Spot Value" and can be used as a monitoring parameter with an individually adjustable threshold. References for different welding tasks can be stored in a database and reloaded as required.

During production, the current resistance curve is displayed in relation to the reference. In addition, the user receives an overview of past evaluations in a live process drift display.

The Q-Inspector is based on statistical data and should therefore only be used with XPegasus Gold or higher, as the extended database enables optimum quality monitoring over longer periods.

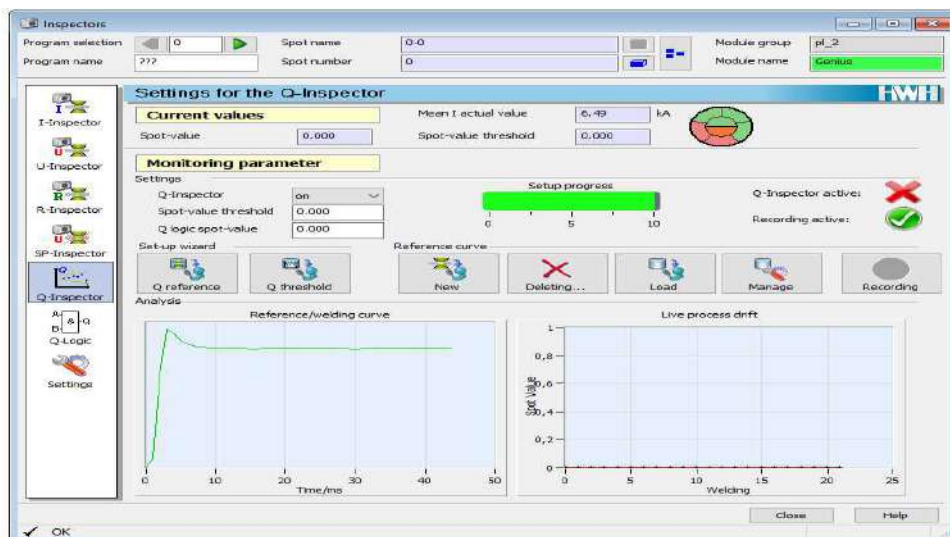


Fig. 2-12 XPegasus Q-Inspector user interface

Applications:

- Spot welding in controlled mode (KSR)
- Spot welding in adaptive operation (IQR).

Monitoring methods:

- Spot value threshold on reference value sources.

S-Inspector (distance measurement)

The path measurement monitors the distance covered by the electrodes. This makes it possible to determine whether the component was inserted at the correct height. During welding, the travel of the electrodes is measured and monitored with the specified tolerances. A preset travel distance or a required gauge block can be checked. Likewise, when a preset sinking distance is reached, a profile changeover or shutdown is possible.

Characteristics / features

- Component control
- Travel distance monitoring
- Final travel position monitoring
- Profile indexing

Component control, travel-in distance or Final dimension monitoring

Applications:

- projection welding in closed-loop operation (KSR)
- Projection welding in open-loop operation (SKT)

Monitoring methods:

- Component control
- travel monitoring
- Gauge block monitoring
- Profile indexing (or shutdown)

Optionen

Depending on the application and welding task, we offer different optional hard- and software packs of our Genius inverters.

If you need a good documentation of your welding quality, we have different packages available for you. As examples we offer you to carry out a component documentation in an internal database, on a PC or server, as well as the documentation of your welding data to an external database.

E. g. for the spot welding task in the sheet metal area we recommend to use our IQFlex system. In this system different tools are available for each spot welding task. Extensive monitoring is already integrated.

Option	Seite
IQR = Integrierte Qualitätsregelung	"IQR - integrated quality control" Auf der nächsten Seite
IQflex = Integrierte Qualitätsregelung inkl. Q-/IQ-Inspector & IQR	"IQFlex - Integrated Quality Control incl. Q-/IQ-Inspector & IQR" auf Seite 27
PQS = Vorbereitung für PQS-Lizenz	"PQS-ready – preparation for PQS licence" auf Seite 30
PDD = Process-Data-Dokumentation nur mit der Feldbuskarte PNSe/PNSo (ProfiNet Slave)	"PDD - Process Data Documentation" auf Seite 32
TT -Trace Tag	"TT - Trace Tag " auf Seite 33
AMC /DCM = Alu-Mode-Classic / AMC + Dynamic Conditioning Mode / DCM	AMC - Aluminium Mode Classic
BD = Vorbereitet für die Bauteildokumentation über den Feldbus	"BD component trace" auf Seite 35
HSC = High Speed Current	"HSC High Speed Current" auf Seite 36
Master	Master
MM1 = Multi-Mess-Funktion	MM1
MM2 = Multi-Mess-Funktion	MM2

IQR - integrated quality control

The integrated quality stabilizing control IQR reacts to events in the resistance welding process that are characteristic of the resistance curve and power curve. Based on this event information, the intelligence of the recognition is used to adjust the current during welding at millisecond intervals. This makes it possible to control disturbance variables in the welding process.

The welding time adjustment is controlled depending on the time of the maximum resistance. The most striking point in the resistance curve is the end of the warm-up phase and the start of melting. From this point onwards, the resistance curve begins to fall again as the contact resistance between the materials is eliminated and the electrode begins to sink in. We call this point the "resistance maximum". This point in time varies. It depends on the disturbance variables that influence the heating process.

Influencing disturbance variables that are compensated are e.g:

- the electrode diameter
- the shunt conditions
- the mains voltage fluctuations
- power losses due to poor fit

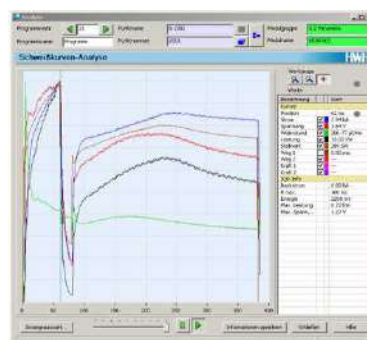


Fig. 2-13 XPEGASUS illustration with IQR settings

Benefits and advantages at a glance

- adaptively controlled from the 1st welding spot without creating a reference
- Robust and stable process right from the start
- Basic parameters can be derived from KSR
- Low parameterization effort
- Power control e.g. for 22MnB5
- Greatly reduced commissioning times
- >95 % iO quality achievable at the first start-up.



Fig. 2-14 XPEGASUS display with IQR settings

From the time of the resistance maximum, the previously increasing setpoint value of the current from previous process information is held at its current level with a delay. This results in a new welding power for the further course of the weld, depending on the disturbance variables. By programming the initial current and the steepness of the increase, called "aggressiveness", the heating can be changed up to the maximum resistance. If, as in rare cases, this is not sufficient, the welding time can also be adjusted depending on the maximum resistance. In this case, the effect on the cycle time must be taken into account. Experience has shown that variations of no more than ± 5 ms occur in robot applications.

IQFlex - Integrated Quality Control incl. Q-/IQ-Inspector & IQR

The new integrated quality-stabilizing flexible product package consisting of reference-controlled regulation IQf and proven integrated quality-stabilizing regulation IQR for events in the resistance welding process.

The IQflex system includes, i,eriments and production or start with IQR from constant current tables and then create references from event-controlled actual curves. For flexible adaptive regulation and optimized monitoring from the first welding point based on the proven Genius platform.

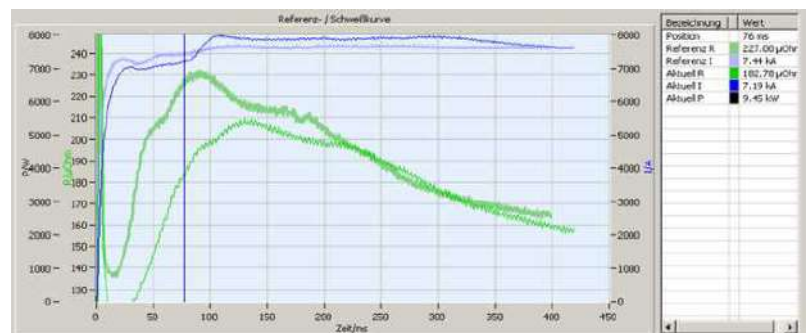
Short commissioning times and easy operation guarantee efficient and cost-effective production. The adaptive package IQflex is specially optimized for these requirements and guarantees the safe spot welding of steel materials.

The basis for our controller are the elementary process variables current and voltage. A precise and reliable measurement signal is available by simple voltage tapping on the secondary side of the transformer. From this, all necessary process variables can be determined.

The actual welding tongs or machines remain free of cables to ensure easy maintenance. By means of the process resistance, which is recalculated every millisecond, the controller adjusts the welding current individually to the requirements of each welding point. This ensures a short process time since the required energy is concentrated. Minimizing cycle time is one of the most important criteria of our customers for the use of IQflex.

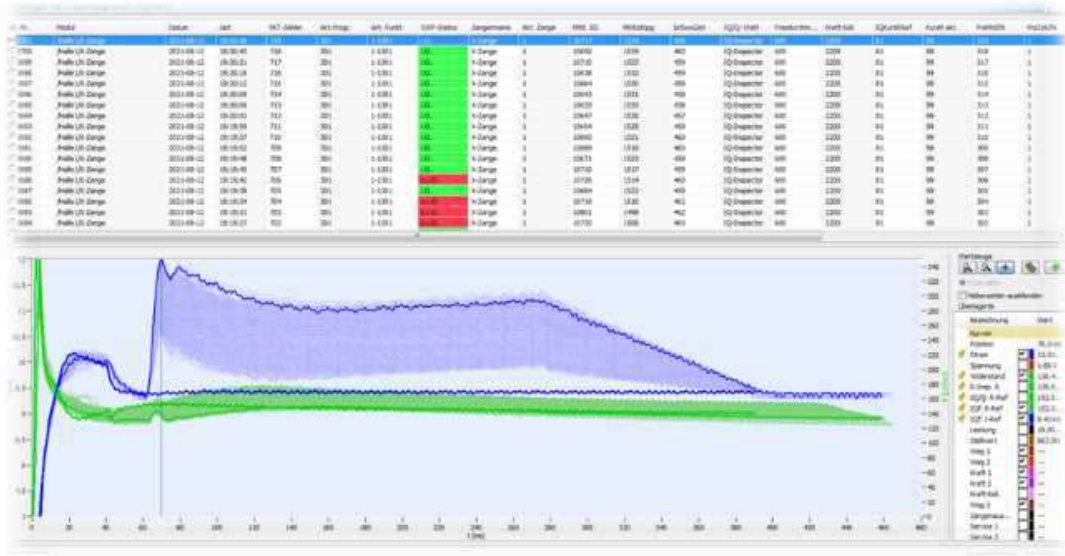
Features at a glance.

- Fast and flexible parameter adjustment through events or reference
- Shunt, electrode wear, and mains voltage compensation
- Compensation of force fluctuations or poor fit



The integrated pre-conditioning enables stable conditions to be established between the electrode cap and the workpiece surface at the beginning of the actual welding process. Regardless of whether the material used is coated or contaminated, welding with IQflex is successful. With a wide-ranging parameterization, IQflex is not only suitable for use in automated manufacturing, but also for the use of hand-held welding tongs.

Only a few welding programs are required to weld a wide range of different combinations of materials with different sheet thicknesses. The IQ-Inspector monitors the quality of each weld, helping you to fully meet your customer requirements.



Automatic stepper with expulsion reduction

Benefits and advantages at a glance:

- Adaptive control from the first point
- Reliable monitoring with our new IQ Inspector from the first welding point
- Industry 4.0 documentation grace to the integrated database
- 100% compatibility with existing IQR parameters
- Further reduced commissioning times
- Reduced commissioning times
- Monitoring and adaptive control without laboratory effort possible
- Adaptive wear adjustment with automatic stepper

IQ-Ergebnisse

Überwachungsparameter						
Lfd. Nr.	Schweißleistung	Energie	Spitzen	IQF-Regelung	Falsch-Beschläge	Qualitätsk.
30	100%	88%	89%	96%	75%	0,62
6	100%	89%	89%	96%	75%	0,80
0	100%	89%	89%	96%	75%	0,60
7	100%	88%	89%	96%	75%	0,60
6	100%	88%	89%	96%	75%	0,80
5	100%	89%	89%	96%	75%	0,86
4	88%	89%	KSP	96%	75%	0,72

Individual weight parameters

PQS-ready – preparation for PQS licence

PQS-ready enables your inverter to install our PQS inline process monitoring system. PQS software licenses are installed on your inverters performing dedicated process monitoring of parameters as current and voltage. The software is called PQS-res.

Characteristics of the PQS-ready option

- Software-based provision of the welding process parameters of current, voltage, resistance, power and distance in the Genius inverter for the PQS-Res software.
- Additional hardware for measured value recording is omitted.

PQS Process monitoring

Our process monitoring systems offer the option of seamlessly monitoring and fully documenting your joining process. Parameters such as current, voltage, resistance, energy, force or penetration can be recorded and monitored. They are used for spot and projection welding, but can also be used for butt and strand welding, for example.

With a Genius welding controller, our process monitoring can be used directly as an integrated option with the PQS-Ready option. Our QUADRIGO measuring module is used with any other welding controller. Mains frequency (50Hz), medium frequency (1,000Hz) or high frequency (10kHz) applications can be monitored. Our monitoring systems are also designed for capacitor discharge welding (CD) and are specially adapted to the respective joining process.

PQS - The proven monitoring system

- Recording the effective values and signal curves of current, voltage, resistance, power, force and displacement
- Monitoring of the process based on known limit values
- Q-stop logic
- Storage of process data in a database with permanent archiving
- Central operation of up to 16 measuring points on one PC
- Zentrale Bedienung von bis zu 16 Messstellen auf einem PC
- Network-compatible versions with server and remote client user interfaces available
- Machine connection via various fieldbus systems and 24V I/O

XPQS – The new dimension of process monitoring

The new XPQS is a further development of the proven PQS process monitoring system, which is reflected by the "X" in the name.

In addition to simplifying commissioning and operation, there are new functionalities such as "outlier detection". This function automatically calculates limits over a preset period on a statistical basis. This means that strongly deviating process variables - the so-called "outliers" - can be detected immediately if they lie outside the limits calculated by the system.

Another new function is the freely configurable monitoring for wear detection. Here, exceeding or falling below a defined range of a parameter (preferably the mean value of the resistance, which usually reflects the electrode wear well) is evaluated as "wear" and signaled separately.

With these two functions, it is possible to influence possible process faults at an early stage during the running-in phase of the systems.

Properties (in addition to PQS)

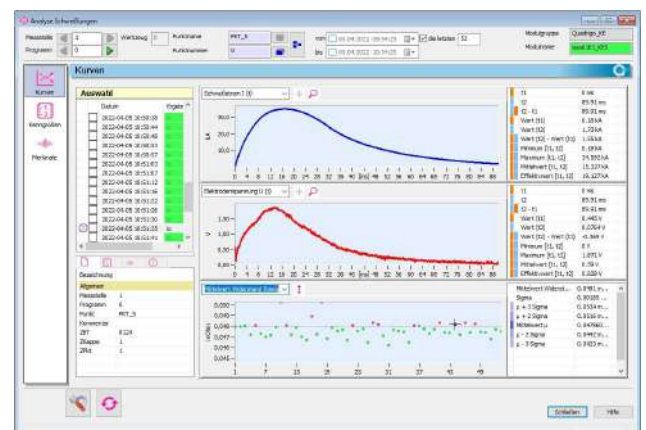
Benefits and advantages at a glance

- Comprehensive process analysis
- Powerful monitoring functions
- Increased competitive advantage and high productivity
- Reduction of inspection costs and inspection time
- Effective production processes
- Comprehensive process documentation
- Visualizes trends of your process enabling you to perform preemtive maintenance.



XPQS LiveView

- New, easy-to-use user interface, simple commissioning
- also available as an easy-to-install workstation version
- Better measurement resolution for short welding times and displacement/force measurement
- Support of two displacement and force channels, e.g. for double-head applications
- Extensive statistical analyses
- Use for component documentation
- OPC-UA interface optionally available



XPQS Analysis

PDD - Process Data Documentation

Option: PDD

"Process Data Documentation" enables the user to query process data from a higher-level system robot via field bus and to store them in the system PLC.

Process data is available directly after each weld. The set is complete with the end-of-sequence signal (EOS). The data is then transferred to the database through the field bus or Ethernet.

Characteristics of Process Data Documentation

- Up to 10 parameters can be selected per weld schedule (weld process).
- The 10 parameters can be selected from a parameter pool. Available parameters are described in a quick guide for easy setup
- Process data is available at the inverter to the next weld

Data is available through parameter IDs

Parameter ID	Designation	Data type	Unit
3528	Current program	UInst32	-
14216	Mean nominal current	UInst32	A
14181	Mean actual current	SInt32	A
14287	Actual welding time	UInst32	ms

Prerequisites

- Profinet card G432-PNS (without I/Os).
- G201 MIO card with 24 V I/O

Remark: Process curves cannot be transferred by PDD mechanism.

TT - Trace Tag

Option: TT

The "Trace Tag" is an accompanying identifier adding for any Genius unit.

This enables the user to add a weld spot identifier to the module's archive data via the Ethernet interface (UDP). (UDP) as data set of 32 ASCII characters.

This can be an order number, a part or body identification number, for instance. This function is used for documentation and tracing to the welding spot or a batch.

Trace Tag currently operates on Profinet and EthernetIP field bus Genius units. The identifier is sent as a UDP packet from the higher-level control system to the Genius inverter. The identifier remains present until a new packet is sent. In case the inverter has been turned off, data must be sent again to be stored in the archive.

Prerequisites

- Genius firmware version: 2.70 or higher
- **X**Pegasus Gold: version 5.2.31 and higher.
- UDP-capable network.
- Setting port numbers.
- Archive configuration.

BD component trace

Anwendungsbeispiel mehrerer Fügeaufgaben mit Teilebezug :

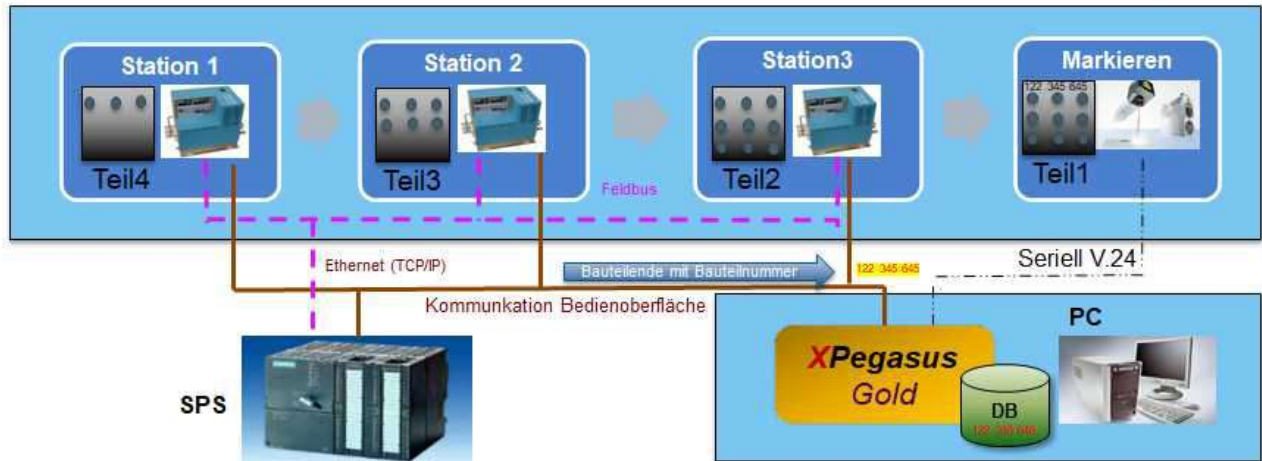


Fig. 2-17 Application example: joining system for hybrid engines

Description

Component trace makes products traceable through a combination of weld data and product related information as the serial number, article number or other related information. Data is combined through a protocol running between the PLC and the Genius timer module. To do this, the Genius inverter must be prepared for component trace. For this, the data recorded during the welding operation are transferred as an archive data record, together with the weld schedule program and the component code, to XPegasus, where they can be displayed. The data can be transferred to the customer for further processing.

Requirements

- XPegasus Version 6.2 or higher

HSC High Speed Current

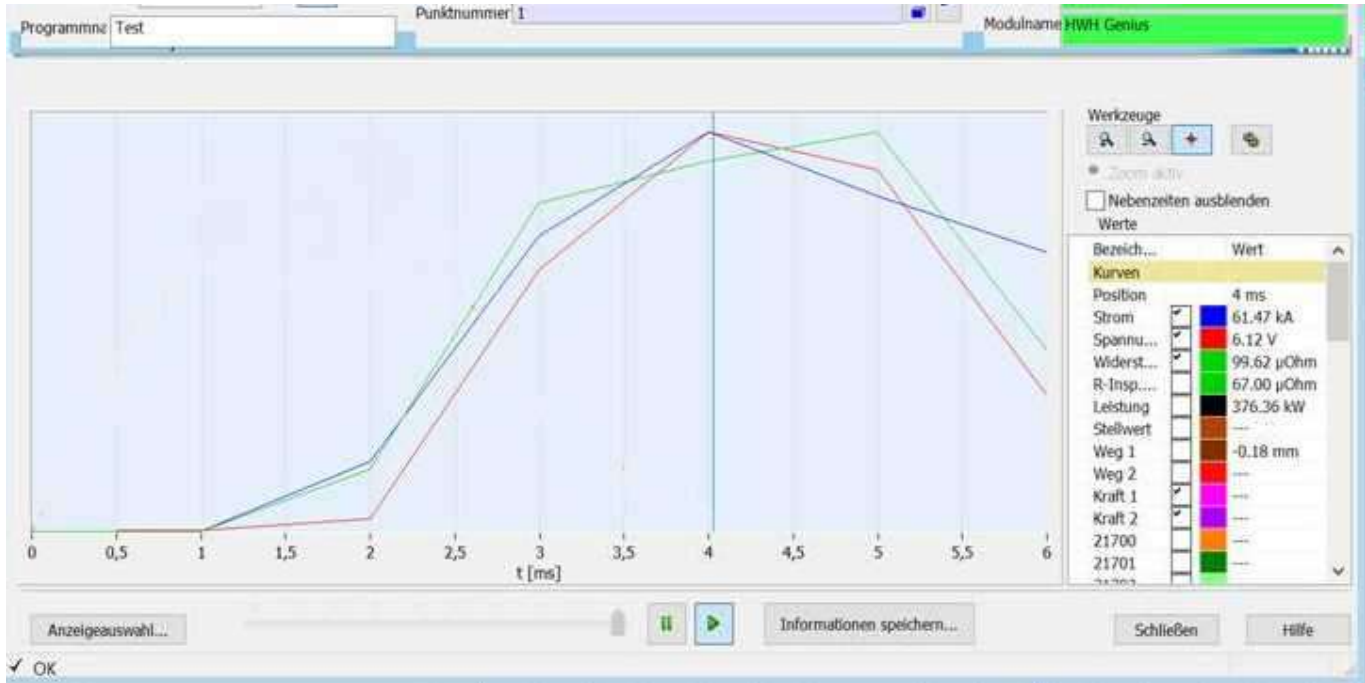


Fig. 2-18 Application example: High Speed Current function

Description

The "High Speed Current" HSC lifts your projection weld to a new level. It pushes the current to the requested set value in a very short time by a modulation of the current.

HSC shows its strength on UHSS materials where extrem short weld times are beneficial. Fast modulation of the secondary voltage is necessary to achieve this.

When joining weld nuts on UHSS materials it is crucial to reach the current set value as fast as possible - HSC makes it happen.

A typical setup consists of a standard Genius MFDC inverter and a transformer. The transformer shall have a secondary voltage of 17 to 21 V. The Gennius must have the option HSC installed. The combination of high secondary voltage and HSC enable this fast current raise replacing CD modules with an affordable price. An existing inverter can also be upgraded with HSC any time. Current raise times of less than 10 ms to 60 kA can easily be achieved.

The operating range in this case is 30 kA – 150 kA.

The "High Speed Current" option is available for the GeniusHWIxx type MF power inverters. Depending on power type, inverter currents of up to 3500 A can be achieved. High speed current suits any Genius MFDC inverter. The units are available with up to 3500 A max output current.

Requirements:

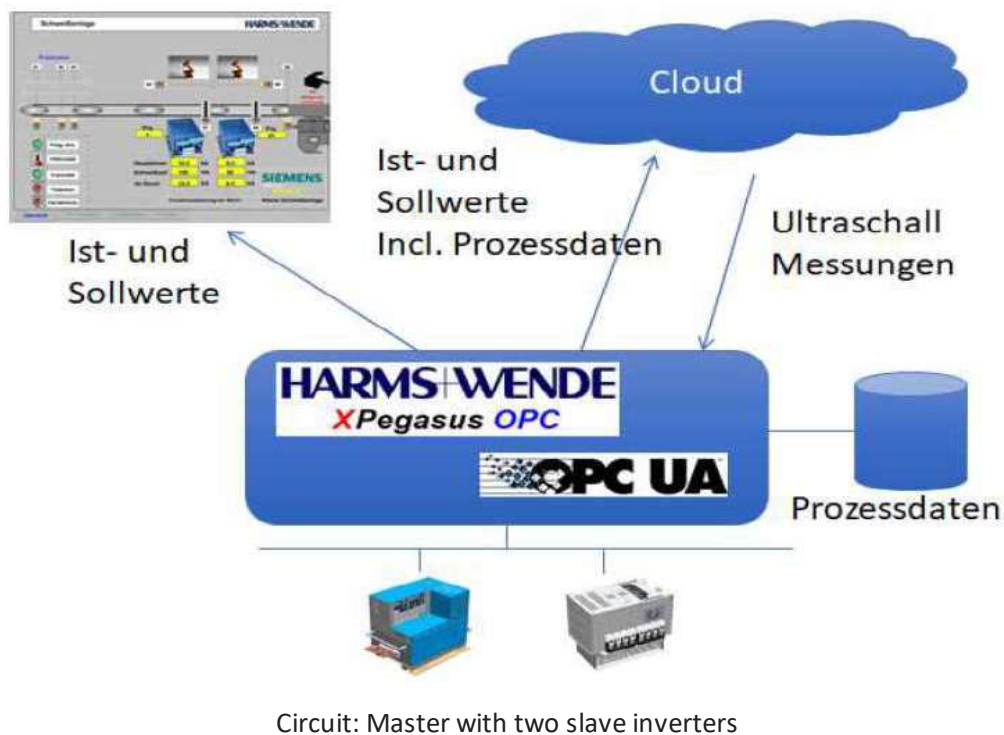
- X Pegasus Gold or higher

Master-Slave systems

When your inverter single inverter does no longer suit the application since more current or longer weld times are needed, the output values can be amplified by adding more power units. The first inverter is called Master unit, the remaining slave units. The master is a regular inverter holding schedules, calibrations and more. The slaves listen to the master unit when to weld synchronously.

At least one transformer is wired up to the master and each slave. It may be multiple ones. Crucial is to keep transformers and cable identical to maintaining synchronous load. A master-slave system can hold max one master and three slaves.

Please note that the total resistance of the secondary circuit determines the max. current level.



Requirements

- Minimum inverter power class 240 kva (1200 A)
- Option Master in the master inverter must be ordered from factory, slaves can be added any time as needed.

Multi Measurement 1 (MM1)

Our Genius inverters are known for its flexibility. A G202 inverter board provides measurement input channels. These can be used i. e. for displacement measurement or force feedback. Intuitive calibration makes the setup simple and fast and just a few requirements are need to use this feature.

Hardware requirements MM1 (option)

- 1 x displacement measurement input - analog 0-10V, 0-20mA, 16 bit resolution
- 1 x force measurement input - analog 0-10V, 0-20mA, 16 bit resolution

Software requirements MM1 (option)

- S-Inspector in 16-bit resolution, see S-Inspector (displacement measurement)
- Force build-up control

Requirements

- G202-AIOX
- XPegasus 6.X or higher

Multi Measurement 2 (MM2)

Option MM2 is an extension of the measuring standard inputs by an additional plug-in module G202 in a Genius system. This module is intended for use with, for example, a double-head welding system. The force sensor is connected to the force measuring input. Parameters for the force calibration as well as the parameters for force build-up control are entered via the X Pegasus HMI user interface, starting from version 6 or higher. A dedicated page is provided for the force inspector. The force build-up control monitors the force shortly before the weld time starts at the end of the hold time. The force is measured and compared with the set tolerance values. If it is beyond the set tolerance band, a message is generated.

Hardware requirements MM2 (option)

- 2 x displacement measurement input - analog 0-10V, 0-20mA, 16 bit resolution
- 2 x force measurement input - analog 0-10V, 0-20mA, 16 bit resolution

Software requirements MM2 (option)

- S-Inspector in 16-bit resolution, see S-Inspector (displacement measurement)
- Force build-up control

Requirements

- G202-AIO
- X Pegasus HMI 6 or higher

GeniusHWI product code

	GeniusHWI	B	U	LL	ww	zzz
Family designation	[Diagram showing a line from the 'GeniusHWI' column to the 'U' column]					
Design	[Diagram showing a line from the 'U' column to the '3' value]					
<ul style="list-style-type: none"> _ = inverter in design with dimensions 15 x 12 x 13 inch 3 = inverter in design with dimensions 31 x 15 x 14 inch 	3					
Mains supply voltage	[Diagram showing a line from the 'U' column to the '4' and '5' values]					
<ul style="list-style-type: none"> 4 = 400 - 440 V, 50/60 Hz 5 = 480 V, 50/60 Hz 	4 5					
Output class and cooling type	[Diagram showing a line from the 'U' column to the '03L' through '36W' values]					
<ul style="list-style-type: none"> 03L = 37 kVA 03W or WA = 50 kVA 06L = 70 kVA 06W or WA = 110 kVA 08L = 100 kVA 08W or WA = 135 kVA 13L = 165 kVA 13W or WA = 195 kVA 16L = 220 kVA 16W or WA = 270 kVA 24W = 385 kVA 36W = 525 kVA 	03L 03W[A] 06L 06W[A] 08L 08W[A] 13L 13W[A] 16L 16W[A] 24W 36W					
<i>Available in design 3</i>	[Diagram showing a line from the 'U' column to the '40W', '45W', and '60W' values]					
<ul style="list-style-type: none"> 40W = 900 kVA 45W = 950 kVA 60W = 1300 kVA 	40W 45W 60W					
Function pack	[Diagram showing a line from the 'U' column to the 'BAS', 'PRO', and 'SEAM' values]					
<ul style="list-style-type: none"> BAS = basic PRO = professional SEAM = seam 	BAS PRO SEAM					
Machine and robot connections	[Diagram showing a line from the 'U' column to the '-ZZZ' value]					
<ul style="list-style-type: none"> See machine and robot connections table 	-ZZZ					

Cooling:

L = Air cooled (force)

W = Water cooled inside panel

WA = Water cooled outside panel

Machine and robot connections -ZZZ

Machine and robot connections

• I/O = 24 V I/O	I/O
• PBS = Profibus DP electrical	PBS
• PNle = Profinet electrical	PNle
• PNlo = Profinet optical slave	PNlo
• PNSe = Profinet electrical slave	PNSe
• PNSo = Profinet optical	PNSo
• ECT = EtherCAT	ECT
• EIP = Ethernet IP	EIP
• CAN = CANOpen	CAN
• CCL = CCLink	CCL
• DEV = DeviceNet	DEV

Optional software functions -VV

Genius optional software functions

• AMC /DCM = Alu-Mode-Classic / AMC + Dynamic Conditioning Mode / DCM	AMC / DCM
• AMF = Aluminium Mode Force	AMF
• BD = prepared for component documentation via fieldbus	BD
• HSC = High Speed Current	HSC
• IQflex = Integrierte Qualitätsregelung inkl. Q-/IQ-Inspector & IQR	IQflex
• IQR = Adaptive feedback welding pack for steel	IQR
• Master	MASTER
• MM1 = Multi-Mess-Funktion	MM1
• MM2 = Multi-Mess-Funktion	MM2
• PDD = Process Data Documentation with PNSe/PNSo (Profinet Slave) fieldbus card only	PDD
• PQS = preparation for PQS licence	PQS
• QI = inspector for quality	QI
• TT = Trace Tag	TT

Using the product code

General structure

The product code of a unit starts with the product family followed by the mains supply voltage and then configuration and features.

Product family: **GeniusHWI3545W-PRO-PNIE**

Selection of the product name starts with the family designation for the GeniusHWI. The design type of the inverter with the control system technology is defined with this designation.

Model within the family: GeniusHWI**3**545W-PRO-PNIE

In the example, a design with the dimensions 778 x 389 x 345 mm is required due to the necessary power. This is indicated by the code B = 3. The different sizes are determined through the digits " ", "2" and "3".

Mains voltage example: GeniusHWI3**5**45W-PRO-PNIE

For connection to the supply network, the inverter must be prepared for the existing voltage. For example, the selection U= 5 means that the inverter can be operated at a 3-phase mains voltage of 480 V with 50 Hz / 60 Hz. Supply voltages of 400 - 440 V 3-phase mains voltage with 50 Hz / 60 Hz are determined by selecting U=4.

Power class example: GeniusHWI35**45**W-PRO-PNIE

The inverter's power class is specified with the selection LL=45W. A range from 20 kVA to 1300 kVA is available for the inverter power units. In the " " type designs, the power units can be provided with various cooling variants. Air cooling is only possible up to a power variant of -x16.

Power units of designs 2x and 3x can only be supplied with water cooling.

Design example: GeniusHWI3545W-**PRO**-PNIE

This part of the product code defines the function pack of the unit. What the pack content is can be found earlier in this section of the catalogue.

Machine interface

This part of the code defines communication on machine level as 24 V hard wiring, Devicenet or other available.

I/O specification example: GeniusHWI3545W-PRO-**PNIE**

The communication level for the machines and the robot connection is defined through the selection ZZZ=PNIE. A selection is eight bus variants is available at this point.

To design your specific model please contact your local partner or us. We are pleased to assist you.

Product codes for weld enclosures

Weld enclosures

This section describes enclosures for the inverter selected. When a complete package is supplied the product code of the inverter and the weld enclosure are combined

On the sticker holding the serial number the article number of the panel is named first, followed by the inverter article number:

45567-12345

45567 Weld enclosure article number

12345 Inverter article number

cabinets listed below are appropriate for GeniusHWI inverters. Compile the cabinet in steps in the sequence from A -> E and 1 -> 13. The result is e.g.:

The composition of the relevant control cabinet characteristics arises from the following characteristics:

Cabinet designation

- SM = cabinet for mounting on machine frame
- SG = floor-mounting housing

Use	Product designation
Inverter in the cabinet	SM-GeniusHWI408L-M48V1.04 - 100-111-10005-000

Family	A	B	C	D	E		
Inverter design	HWI						
<ul style="list-style-type: none"> • Genius - 							
Control cabinet supply voltage		4 5					
<ul style="list-style-type: none"> • 400 V - 440 V • 480 V 							
Output classes			03 06 08 13 16 24 36 40 45 60				
<ul style="list-style-type: none"> • 03 = 37 kVA (L) - 50 kVA (W) • 06 = 70 kVA (L) - 110 kVA (W) • 08 = 100 kVA (L) - 135 kVA (W) • 13 = 165 kVA (L) - 195 kVA (W) • 16 = 220 kVA (L) - 270 kVA (W) • 24 = 385 kVA • 36 = 525 kVA • 40 = 900 kVA • 45 = 950 kVA • 60 = 1300 kVA 							
Cooling					W WA L		
<ul style="list-style-type: none"> • W = water cooling • WA = external water • L = air cooling 							

Family	A	B	C	D	E
I/O profile with the version number of the 24 V unit					
• M48V1.04					M48V1.04
• M49V1.02					M49V1.02
• M61V1.01					M61V1.01
• M88V1.00					M88V1.00

The composition of the relevant control cabinet characteristics arises from the following characteristics:

Cabinet designation

- SM = cabinet for mounting on machine frame
- SG = floor-mounting housing

Family	1	2	3	4	5	6
Weld enclosure size						
• 0 = 24 x 47 x 16 inch	0					
• 1 = 29 x 24 x 350 inch	1					
• 2 = 24 x 47 x 16 inch	2					
• 3 = 32 x 63 x 20 inch	3					
Socket						
• 0 = without		0				
• 1 = 4 inch		1				
• 2 = 8 inch		2				
• 3 = closed bottom		3				
Door hinges (mounting side)						
• 0 = right			0			
• 1 = left			1			
• 2 = both sides			2			
Mains breaker						
• 0 = Eaton load-interrupter switch				0		
• 1 = Eaton power switch				1		
• 2 = ABB load-interrupter switch				2		
• 3 = ABB power switch				3		
Mains switch amperage						
• 0 = 63 A					0	
• 1 = 100 A					1	
• 2 = 125 A					2	
• 3 = 160 A					3	
• 4 = 200 A					4	
• 5 = 250 A					5	
• 6 = 400 A					6	
• 7 = 630 A					7	
Personal protection						
• 0 = without						0
• 1 = Residual current monitoring						1
• 2 = differential current monitoring, higher currents W60AB						2
• 3 = Mains breaker with integrated residual current monitoring.						3
• 4 = fault voltage monitoring PFU6 (SI10)						4

Family	7	8	9	10	11	12	13
Location electrical connections							
• 0 = without	0						
• 1 = rear	1						
• 2 = bottom	2						
• 3 = top	3						
• 4 = left	4						
• 5 = right	5						
Electrical connections							
• 0 = without		0					
• 1 = passage		1					
• 2 = pluggable		2					
Location of media supplies							
• 0 = without			0				
• 1 = rear			1				
• 2 = bottom			2				
• 3 = top			3				
• 4 = left			4				
• 5 = right			5				
Media type							
• 0 = without				0			
• 1 = 3/8" external thread water connection on cabinet				1			
• 2 = M22x1.5 24° external thread water connection on cabinet				2			
• 3 = M16x1.5 24° water connection on inverter				3			
• 4 = 1/4" 60° water connection on inverter				4			
• 5 = HIP water 1/2" 37°, air 3/8" 45°				5			
• 6 = HIP water 1/2" M22x1.5 24°, air M16x1.5 24°				6			
Signals on terminal							
• 0 = without					0		
• 1 = all 24 V I/O signals without measurement lead					1		
• 2 = measurement lead U + I + S					2		
• 3 = all 24 V I/O signals and all measurement leads					3		
24 V-Power supply							
• 0 = without						0	
• 1 = internally via power supply 3 A						1	
• 2 = externally via 2x AIDA						2	
• 3 = externally via 1x AIDA						3	
• 4 = externally via XLP						4	
• 5 = externally via XLP						5	
Lamps & Push buttons as control elements							
• 0 = without operating element							0
• 1 = with operating element							1

HIP = Media plate air-water

Due to the control cabinet size, the following characteristics can be compiled:

Variant table

Weld enclosure dimensions	Operation	Mains breaker [A]							
		63	100	125	160	200	250	400	630
24 x 47 x 16 inch	X	X	X	X					
29 x 24 x 350 inch	X	X	X	X	X				
24 x 47 x 16 inch	X	X	X	X	X	X	X		
32 x 63 x 20 inch	X	X	X	X	X	X	X	X	X

Usage example of the inverter model:

Product code (left to right)	Description
Cabinet designation	SM
A	GeniusHWI
B	400 - 440 V
C	406
D	W
E	M48V1.04

Usage example of the control cabinet version

Digit product code	Code digit - description
1	1 - WxHxD: 740x600x350 mm
2	0 - without base
3	0 - door hinge on right, double-bit lock 3 mm
4	1 - Eaton power switch
5	1 - 100 A
6	1 - personal protection: Residual current monitoring (max 3x 50mm ²)
7	1 - location of the electrical connections: rear side of control cabinet
8	1 - type of electrical connections: passage
9	0 - without media connections (location)
10	0 - without media connections (type)
11	0 - without signals on terminal strip / accessories
12	5 - 24 V supply: externally via XLP (US1)
13	0 - without operating elements
14	0 - reserve
15	0 - reserve

Use	Product designation
Inverter in the cabinet	SM-GeniusHWI408L-M48V1.04 - 100-111-10005-000

Preferred type: spot welding - SR-GeniusMFI408L BUS -vv PNIe [M49V-1.02]: Weld enclosure for mounting on robot enclosure 100-111-1100-050-00-de

Location in the code	Inverter version
1	1 - BxHxT: 740x600x350mm, RAL7035
2	0 - without base
3	0 - Right-hand door hinge, Double bit 3 mm locking mechanism
4	1 - Eaton power switch
5	1 - 100 A
6	1 - Personal protection: Residual current monitoring (max 3x 50mm ²)
7	1 - location of the electrical connections: rear side of control cabinet
8	1 - type of electrical connections: passage
9	0 - without media connections (location)
10	0 - without media connections (type)
11	0 - without signals on terminal strip / accessories
12	5 - 24 V supply: externally via XLP (US1)
13	0 - without operating elements
14	0 - Reserve
15	0 - Reserve

Preference type: projection welding - SR-GeniusHWI416WA BUS - [M49V-1.02]: Weld enclosure for mounting on machine frame 000-021-2114-010-00-de

Location in the code	Inverter version
1	0 - BxHxT: 600x760x350mm, RAL7035
2	0 - without base
3	0 - Right-hand door hinge, Double bit 3 mm locking mechanism
4	0 - Eaton load-interrupter switch with U-trip 24VDC
5	2 - 125 A
6	1 - Personal protection: Residual current monitoring (max 3x 50mm ²)
7	2 - location of the electrical connections: Control cabinet bottom
8	1 - type of electrical connections: passage
9	1 - Control cabinet rear
10	4 - 1/4" male thread, inner cone 60°
11	0 - without signals on Terminal block / accessories
12	1 - internal via power supply 3A with XLP and XL8
13	0 - without operating elements
14	0 - Reserve
15	0 - Reserve

Preference type: projection welding - SG-GeniusHWI424WA/436WA - [M49V-1.02]: Weld enclosure for mounting on socket 220-152-2014-010-00-de

Location in the code	Inverter version
1	2 - BxHxT: 600x1200x400mm, RAL7035
2	2 - Height: 200 mm
3	0 - Right-hand door hinge, Double bit 3 mm locking mechanism
4	1 - Eaton power switch
5	5 - 250 A
6	2 - differential current monitoring, higher currents W60AB
7	2 - location of the electrical connections: Control cabinet bottom
8	0 - without connections electrical (type)
9	1 - Control cabinet rear
10	4 - 1/4" male thread, inner cone 60°
11	0 - without signals on Terminal block / accessories
12	1 - internal via power supply 3A with XLP and XL8
13	0 - without operating elements
14	0 - Reserve
15	0 - Reserve

PC operating software

XPegasus Silver

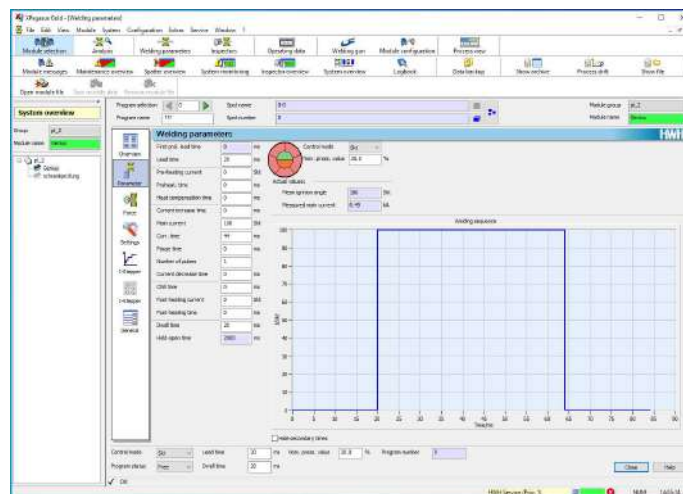
Programming and operating

XPegasus Silver includes all functions to program and operate your weld timer modules. The user gains a continuous and quick overview about the current state of each weld timer module with ability to program it.

XPegasus Silver is the base model with a full set of powerful functions for your production and enables up to 60 users can be defined.

Control effectively

XPegasus offers you functions for easy programming, data back-up and much more besides. Program wizards guide you through complex tasks and guarantee fast and easy operation. For user ease of use, XPegasus shows functions as installed on the weld timer unit only.



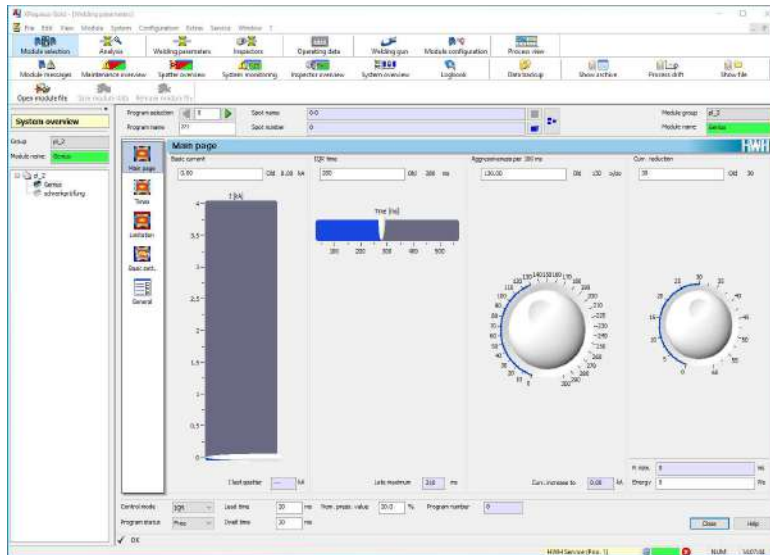
Analyse your process

Recent weld feedback data is graphically shown in the analysis window. This is a power tool in the commissioning phase as well every day to check weld processes. You therefore have a tool for analysing, diagnosing and monitoring your welding processes.

Create your own reports by exporting data such as program parameters, e.g. to Excel, with just one click. A log book documents all changes for you. Back-up your data with the integrated data back-up system.

Maintain an overview

Depending on application, X Pegasus enables operation of your modules, which you can group individually as required. This provides you with a quick overview of your production, or individual machines, cells or entire systems if desired.



The Universal interface

X Pegasus Silver identifies weld timers connected and shows what these timers have installed.

Weld timers suitable are:

- GeniusMFI, GeniusHWI
- GeniusAC
- HWI 28XX EVA / EVA-IQR
- Ratia 73 IQ0 bis IQ2

Also in mixed operation, of course.

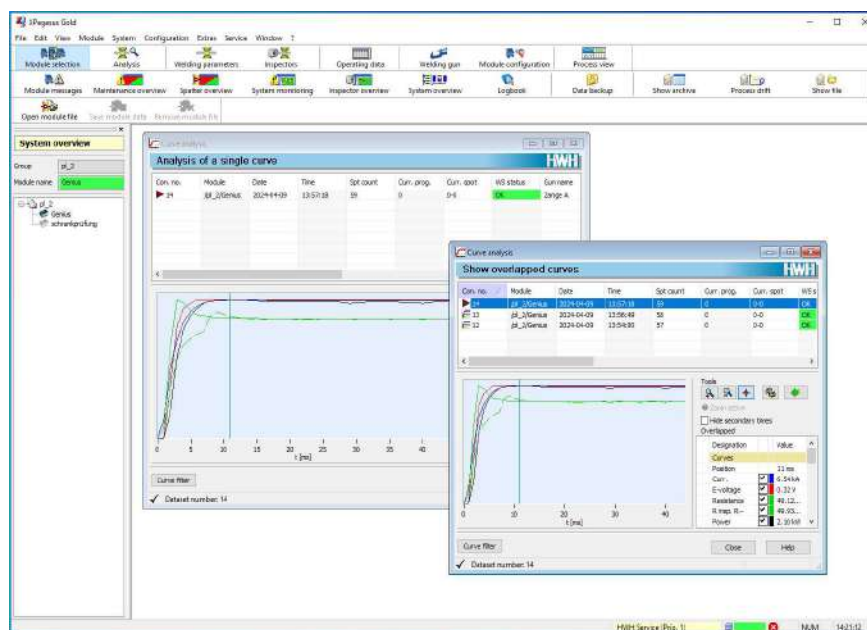
XPegasus Gold

Controlling, operating and archiving

The XPegasus Gold extends XPegasus Silver by an SQL database for documentation of weld parameters. Up to 60 modules can be connected and administrated typically.

Monitor your welding processes

XPegasus Gold allows the user to review your welds by viewing the database.



Secure your knowledge

XPegasus Gold integrates various databases, which you can select as required, to archive your data.

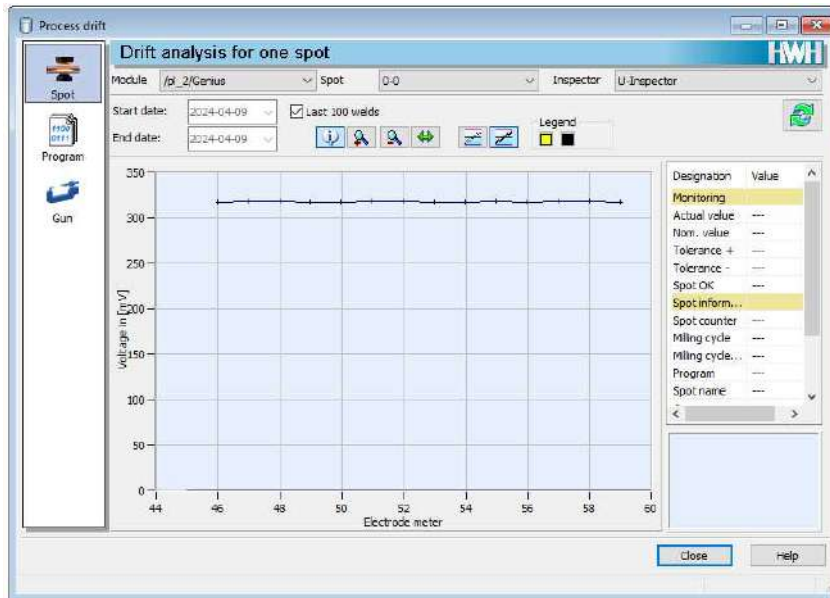
XPegasus Gold highlights:

- Graphical programming incl. IQR Easy (available as a Genius option)
- Excel integration for importing and exporting data
- Program wizards for quick configuration

Increase your machine availability

The XPegasus drift analysis supports you in solution finding.

Here, you can monitor the course of your welding processes over time and any possible deviations.



The universal user interface

XPegasus Gold slots perfectly into the Harms & Wende control systems.

Use XPegasus Gold to operate your

- GeniusMFI, GeniusHWI
- GeniusAC
- HWI 28XX EVA / EVA-IQR
- Ratia 73 IQ0 bis IQ2

Also in mixed operation, of course.

XPegasus Platinum

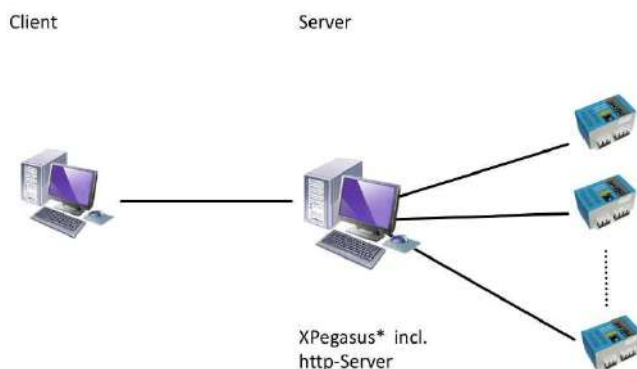
Controlling, operating, archiving and as a server-client application

XPegasus Platinum extends the Gold version by a dedicated server solution. It's the dedicated solution for large systems in large and divided productions over different plants. You can therefore comfortably access a module from various workstations (client PC). The server takes care of the details, e.g. archiving your process data. The up to eight client PCs function as control computers on the machines/in the systems.

XPegasus Platinum enables up to 60 modules to be administered.

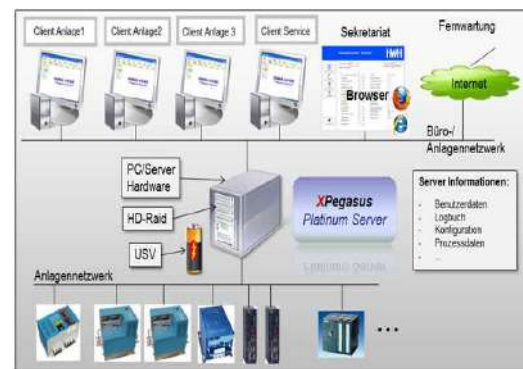
Monitor your welding processes

XPegasus Platinum enables you to access all modules connected to the server from any client.



Increase your machine availability

XPegasus Platinum also supports you in solution finding. A wizard guides you through typical situations. Ensuring that you quickly regain control of your process and save money!



Information at any time

XPegasus Platinum integrates various databases, which you can select as required, to archive your data. Back up your data – security for you.

XPegasus Platinum highlights:

- Graphical programming incl. IQR Easy (available as a Genius option)
- Excel integration for importing and exporting data
- Program wizards for quick configuration
- Access to a module possible from various workstations/clients
- Server-client application

The universal user interface

XPegasus Platinum slots perfectly into the Harms & Wende control systems.

Use XPegasus Platinum to operate your

- GeniusMFI, GeniusHWI
- HWI EVA and EVA-IQR
- Ratia43/73

Also in mixed mode, of course!

XPegasus *Platinum compact*

Server/client solution for small installations

The **X**Pegasus **Platinum compact** is the smaller brother of **X**Pegasus **Platinum** offers all functions as the bigger model and is only limited to 10 modules. It is offered for a lower and affordable price.

XPegasus **Platinum compact** server solution, the software variant with maximum functionality, allows centralized management of multiple installations. This means that all data (archive, backup files, log files, etc.) are always stored on the central server and are accessed from there by any type of client (line PC, service laptop, office PC, etc.). If a customer-specific part number of the welded components is assigned to each stored process data record, the production process can be traced back in the archive at any later time using this number (so-called traceability).

As **X**Pegasus **Platinum** also the compact version can be extended by an OPC UA interface.

Target group / users

Small part welding, Tier 1 suppliers and users with small networked systems with one or more Genius inverters.

Advantages

XPegasus **Platinum compact** version offers you a significant economic advantage when the full strength of the full version is not required due to the small size of the installation. However, no other function is limited except reduced network capacity.

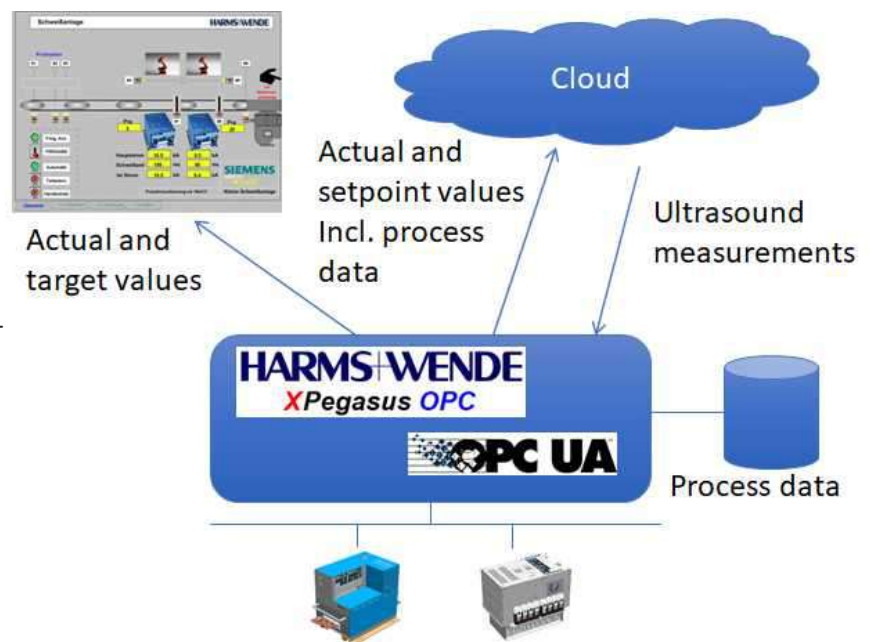
In addition, **X**Pegasus **Platinum compact** can be considered as an entry-level variant into the **Platinum** functionality. If your plant becomes larger in the future or if you then want to integrate several plants into a cluster, the software can always be converted into the full version or subsequent license **X**Pegasus **Platinum** by upgrading accordingly.

XPegasus Platinum OPC-(UA)

XPegasus Platinum OPC-UA

XPegasus Platinum OPC version is available for flexible integration of process data in various higher-level customer systems (up to the cloud). The proven open communication standard can be regarded as the world language for industrial technology and enables machines to communicate with each other regardless of manufacturer.

The functionality of the integrated interface enables not only the pure retrieval of archive data, but also a transparent and extensive machine-to-machine communication (e.g. with PLC), which can give you many advantages when designing your plant architecture.



Advantages

With an OPC UA interface in the XPegasus database, you can, for example, archive the additional component-related inspection data, such as the measurement data from ultrasound, inspection cameras, etc. On the other hand, you can use it to transfer the selected archive data from XPegasus to the higher-level central database in order to manage it further according to your own IT concept.

We recommend that you take advantage of a training course when using this technology for the first time. Our experts will help you and your team to make integration into your application as easy as possible so that you don't lose any time. Get in touch with us.

Xcomand2.1 - success with "touch"!

Xcomand2.1 is the comfort HMI to one Genius MFDC inverters on machines performing demanding welds with extended monitoring and data storage (option). No network is required, the system operates standalone.

The special designed mains screen holds core information about the process at a glance.

Xcomand2.1 enhances this performance even further. An even faster processor is used here, making operation even smoother. The colour touch display is available in 15" sizes.

Xcomand2.1 with process data archiving is ready to archive your welding data. Simply connect the Xcomand2.1 to the inverter and the PC using a switch. The CD with the XPegasus process data archiving software, article No. 40967, is installed on the PC.

> New with process data archiving on the PC



Fig. 3-1 Xcomand2.1 - the color touch display

The setup is very intuitive and easy to operate. Learning times are short and time to have the whole system operational short.

Quick buttons can be customized and set to functions needed in your production. This brings the system to WYSIYG state - just whats needed - no overhead.

The quick access page provides an overview of the most important information:

- Inspectors
- Quick parameterisation
- Welding curve analysis and history of the last welding processes including quality values
- Quick access to module messages
- Manual program selection

Comparison of X Pegasus models

X Pegasus overview	X Pegasus Silver	X Pegasus Gold	X Pegasus Platinum compact	X Pegasus Platinum	Xcomand2.1
operate	X	X	X	X	X
Networking	X	X	X	X	-
archive (Genius)	-	X	X	X	Optional
Server integration	-	-	X	X	-

X Pegasus offers you a high-performance software package which supports you in your daily work.

Device versions supported by X Pegasus	
GeniusMFI GeniusHWI	All versions as of Genius firmware version 1.0
HWI28xx	HWI28xx from firmware version 8.22 (ZUP from 8.18) or 9.45 with Ethernet interface, (not compatible with 9.x versions) archiving is not supported, ZUP systems (gun switching PCB) are not supported.
Ratia73/43	Ratia73 from Firmware version 5.40 Ratia43 from Firmware version 6.05
GeniusACS	All versions as of GeniusACS firmware version

ZUP: is our multi gun system for prototype shops.

The following PC equipment is recommended: X Pegasus data sheet		
PC	With current hardware equipment	
Processor	Processor with multi-core technology with at least 1.8 GHz Performance class (example): Intel Core™ i3 or higher AMD Athlon™ II or higher	
RAM	At least 4 GB	
Partition size	At least 20 GB	
UPS (uninterruptable power supply)	With connection to Windows Power Management With activated archive function	
Number of modules for simple database control & operation	X Pegasus Silver/Gold X Pegasus Platinum X Pegasus Platinum compact	40 modules permissible 60 modules permissible 10 Module zulässig 3 Clients
Number of modules for extended database documentation & analysis	X Pegasus Silver/Gold X Pegasus Platinum X Pegasus Platinum compact	20 modules permissible 30 modules permissible 10 Module zulässig 3 Clients

XPegasus **X**Lab - Process transfer from laboratory to production - Lab2Fab

The purpose of Lab2Fab is to shorten the ramp-up time of high volume production lines drastically by a rapid and reliable data transfer from the lab to the line. Each material stackup combination (MSC) of your planned production is made under standardized and controlled conditions. The XLab software serves as operative software to create your everyday IQflex schedules for steel spot welding.

Following your specified weld test procedure, a weld recipe is generated for the current (MSC) which holds a data for the acceptable weld range from acceptable spot diameter to the expulsion limit. These recipes are accepted then by your quality assurance and end up encrypted in the database to prevent unwanted manipulation.

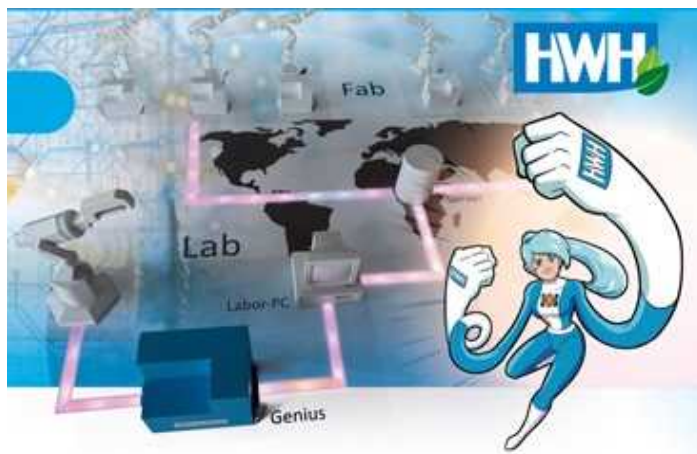
The centralized plant management using XPEgasus Platinum+ HMI the generated recipes are transferred to all weld timers. The new IQflex technology package automatically reacts on weld gun characteristics, material fluctuations and more. In case adjustments are required, just pick another approved recipe - just use what has been approved. The method works on regular steel materials to UHSS types and is suitable for large OEM systems and tier installations.

Features:

- Qualification of your materials in the lab
- Easy operation and process adaptation
- Simple parameterization even for complex sheet metal combinations
- Improved balance between offsite and onsite parameterization
- Retrofittable as a software upgrade for existing Genius inverters
- 100% compatibility with existing process settings (with Genius inverters)

Benefits:

- Short commissioning times through the use of proven parameters
- Consistent quality through intelligent process monitoring
- Reduced product implementation cost through the use of a central parameter database
- Global availability of technical expertise through centralized management of welding parameters
- Lower error rate through cross-functional welding task assignment
- Equal spot diameter due to in-line reaction when the weld is made
- Usage of pre-approved recipes ensures a reliable weld process



1. Create a weld recipe in your own lab (XLab):

- Instead of individual traditional weld schedule programming at the weld timer, just use proven recipes
- A wizard guides through the process to avoid wrong programming.
- Logging for traceability and quality assurance (QA)

2. Transfer data to systems worldwide (XPegasus Platinum+):

- Minimal effort required for commissioning and optimization
- Online access for process specialists
- No adjustment of process monitoring required

3. Compensate for local deviations (IQflex):

- Compatible with any clamp geometry (clamp compensation)
- Adaptive welding with monitoring starting from the first spot
- Simplified optimization through predefined parameter configurations within the welding recipe

Benefits:

With an OPC UA interface in the XPegasus database, you can archive additional component-related test data, such as measurement data from ultrasonic testing, inspection cameras, etc. Additionally, you can use it to transfer selected archived data from XPegasus to the higher-level central database for further management according to your own IT strategy.

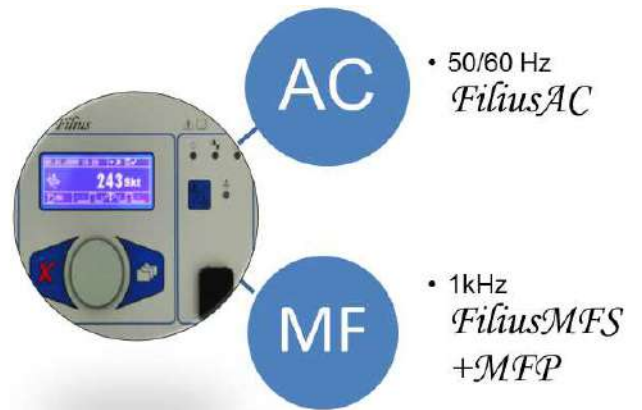
Requirements

- Weld timers GeniusMFI and GeniusHWI are suitable for the IQflex technology - existing units can be upgraded.
- XPegasus Platinum user interface
- XLab software for creating welding recipes in the laboratory (optional)
- XPegasus Platinum+ software for centralized management of multiple data servers (optional)

Filius product series



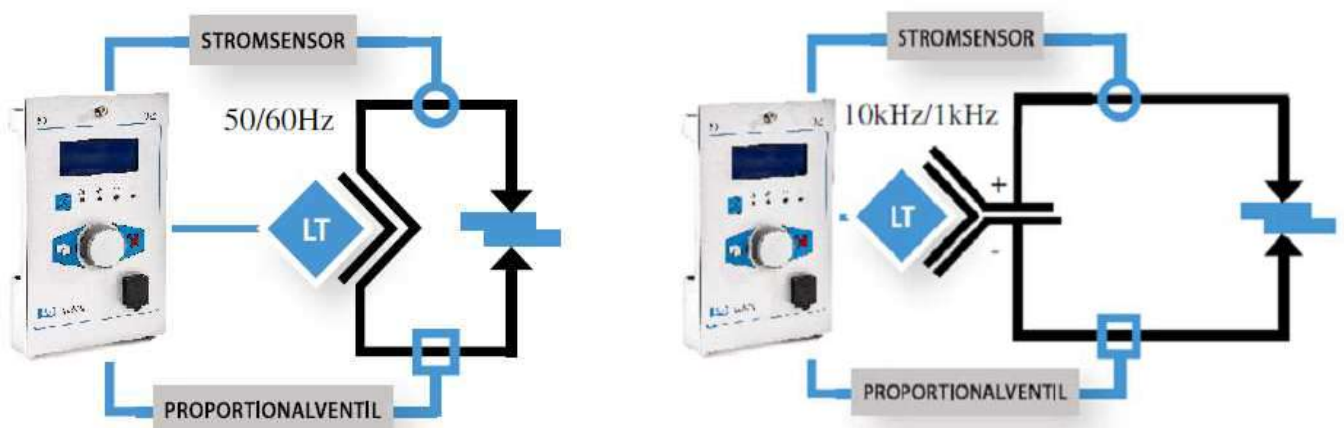
Filius Beta



Characteristics

The Filius product series available in AC and MFDC technology raises the bar of comfort and functionality to the next level. Simple press-and-turn operation with almost any words makes it language independent and easy to use. Backup functionality allows to save crucial data as well as to move them to other Filius modules in your production.

Existing customers with MPS 100 - 300 weld timers maintain continuity by upgrading to Filius.



Operating concepts:

Turn-and-press turn principle, language independent.

Operation

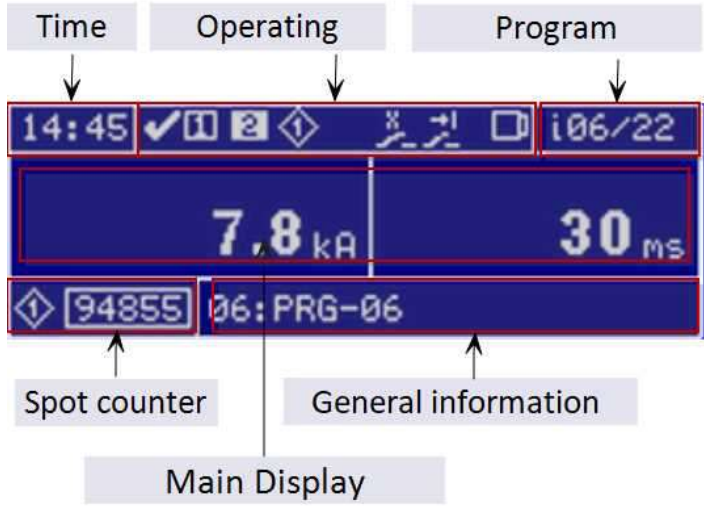


Fig. 4-1 *Filius* display

Description

Filius supports different user levels as master and operator mode. Depending on the mode different parameters and menus become accessible. Turn-and-press with one central jog wheel allow to change setting even in harsh production environment with gloves.

Communication to external systems are available through 24 V IO hard wiring.

Keeping future developments in mind, updates can be simply be made through the USB plug in the front. The cover protects it from dust and dirt.

Firmware updates or function extensions can be loaded comfortably using a pen drive.

Technology selection

Filius is available in AC and MFDC technology. AC requires a thyristor stage, times in periods. MFDC a power unit, times in milliseconds.

Technology	Description	Remarks
MF	Medium-frequency (1 kHz)	
AC	Mains frequency system (50/60 Hz), 1-phase	

shapes

The Filius system can be supplied in several variants.

Filius is available in different shapes:

- Compact

Slim design, small fitting almost anywhere needed

- Beta

Traditional "high" shape used long time back, identical with earlier MPS 200 units.

Shape	Description
S-B	Welding control system without power unit, beta format
S-C	Welding control system without power unit, compact format

Classic function scope

Filius welding control systems are suitable for spot and projection applications and the seam function with a gun and extended function scope.

The "Classic" version is the solution for automated welding tasks in mechanical engineering.

It offers the option of controlling a pressure or force program with the second solenoid valve or the proportional valve output. 128 programs are available for the various tasks.

The "Classic" version always includes the IQ functions as well as further features:

- Secondary current regulation (CCR)
- Current limit value monitoring
- Program sequences
- Force/pressure program with solenoid valve/proportional valve output 0-10 V
- Upslope / Downslope
- Internal / external schedule selection

Electrode management and proportional valve control are, of course, also included. Program selection is possible internally or via actuation of the I/O level.

Standard function scope

- 128 schedules
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/O
- Secondary current regulation (CCR)
- Electrode management
- Stepper function
- Upslope, Downslope
- Pulses
- Proportional valve output 0-10 V
- Current limit value monitoring current
- Force/pressure program with solenoid valve and proportional valve output 0-10 V
- Program sequence



Filius Compact

Distance monitoring

- Component control
- Sink-in distance
- Final dimension

Stepper function

- Linearised stepper function with 10 supporting points

Program sequences

- Up to 128 schedules in succession
- Programmable program switching time at least 100 ms

Profile indexing

- Pre-heating time (with time slot)
- Main current time (with time slot)
- Post-heating time (with time slot)

Force/pressure program

- MV2-Verz, MV2-Ein1, MV2-Aus, MV2-Ein2

Multi function scope

Application areas: for spot and projection applications plus seam function for up to two welding facilities.

The "Multi" version is optimal for all manual mechanical engineering welding tasks. This version is equipped with 24 V I/O, outputs for actuating two solenoid valves and one pre-stroke valve, two analogue outputs for force settings via proportional valves and 2x16 programs.

The "Multi" version always includes the IQ functions:

- Secondary current regulation (CCR)
- Current limit value monitoring
- Displacement measurement
- Internal / external schedule selection
- Distance measurement

Electrode management and proportional valve control are, of course, also included. Program selection is possible internally or via actuation of the I/O level.

Standard function scope

- 2 x 16 schedules
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/O
- Constant current regulation (KSR)
- Electrode management
- Upslope / Downslope
- Pulses
- 2 x proportional valve output output 0-10 V
- Current limit value monitoring current
- Further interfaces, see options and equipment, "Model" auf Seite 70.



Filius Beta

Distance monitoring

- Component control
- Sink-in distance
- Final dimension

Profile indexing

- Pre-heating time (with time slot)
- Main current time (with time slot)
- Post-heating time (with time slot)

Mono function scope

For spot and projection applications plus seam function for an electrode holder.

The "Mono" version is the entry-level equipment for all mechanical engineering weld jobs. It is equipped with 24 V I/O, hard wiring for actuating a solenoid valve and a pre-stroke valve as well as eight programs.

Of course, electrode management is also available. Program selection is possible internally or via actuation of the I/O level.

Standard function scope

- 8 schedules
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/O
- Output for 1 solenoid valve, 1 pre-stroke valve
- Electrode management
- Upslope / Downslope
- Pulses



Filius Beta

Model comparison

Varianten (Funktionalität)	Mono	Multi		Classic	
Functions	AC	AC	MF	AC	MF
Time input	Per/HW/ms	Per/HW/ms	1 ms	Per/HWms	ms
Start inputs	1	2	2	1	1
Pre-stroke valve	1				
Solenoid valves	1	2			
Proportional valves	0	2	2	1	1
Mains voltage compensation	Yes	Yes	No	Yes	No
Analogue nominal value input	No			Yes	
Current regulation	No	Yes			
Force calibration in kN	No	Yes			
Signal exchange 24 V I/O	Yes				
Parameter back-up via USB	Yes				
USB plug in front and cover	Yes				
schedules	8	2x16		128	
Program inputs	3	4		7	
Internal program selection	Yes				
External program selection	Yes				
Status display	Yes				
Spot counter menu	Yes				
Process and editing menu	Yes				
Configuration menu	Yes				
Limit monitoring / current	No	Yes			
Distance monitoring	No	Yes			
Stepper function	No			Yes	
Force/pressure program	No			Yes	
Program sequence	No			Yes	

Filius product codes

	Filius	CC	B	ww	zzz
Family designation	[Diagram: Filius line connects to CC, B, ww, and zzz]				
System designation	[Diagram: CC line connects to AC and MF]				
<ul style="list-style-type: none"> • Alternating current 50/60 Hz, 1-phase • Medium-frequency 1 kHz, 3-phase, 50/60 Hz 	AC MF				
Design	[Diagram: B line connects to S-B and S-C]				
<ul style="list-style-type: none"> • Beta (7x12x3 inch- WxHxD) • Compact (9x7x3 - WxHxD) 	S-B S-C				
Model	[Diagram: ww line connects to -Mono, -Multi, and -Classic]				
<ul style="list-style-type: none"> • Mono • Multi • Classic 	-Mono -Multi -Classic				
Machine and robot connections	[Diagram: zzz line connects to -I/O]				
<ul style="list-style-type: none"> • I/O = 24 V I/O 	-I/O				

FiliusACS-connection cable

Designation	Part No.	Description
FILIUSACS-VK2-2.0M	39058	Connecting cable 2.0 m between FILIUSACS control stage and LE7/1 power stages
FILIUSACS-VK2-3.0M	35469	Connecting cable 3.0 m zwischen Steuerstufe FILIUSACS und den Leistungsstufen LE7/1
FILIUSACS-VK2-5.0M	40442	Connecting cable 5.0 m between FILIUSACS control stage and LE7/1 power stages

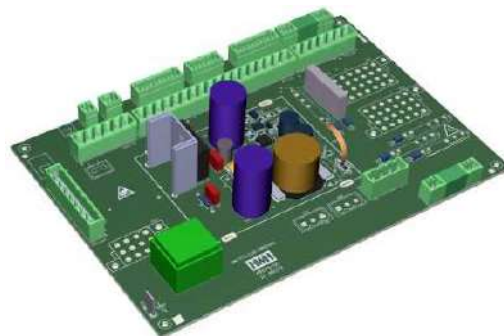
FiliusACS- Adapter

Designation	Part No.	Description
AK-FILIUS-MPS200	45071	for replacement connection of a FiliusACS instead of an MPS200, (MPS100, MPS300) control stage
AK-FILIUS-MPS80XX	45179	for replacement connection of a FiliusACS instead of an MPS80x3x or MPS8043/1 control stage

Filius Adapter

Connection adapter AC-Filius-MPS/-100-200-300

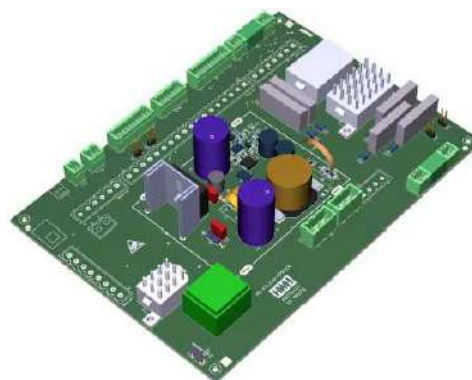
The AK-Filius-MPS200 connection adapter enables the FiliusACS-x welding controller to be used as a replacement for the proven MPS100, MPS200 and MPS300 series welding controllers. The supply voltage of the FiliusACS-x welding control is provided with 24 VDC and a separate synchronous voltage. The control system can be operated and parameterized, and at the same time the power circuit can be switched off for system safety and energy saving. The proven welding controllers draw their supply voltage from the synchronous voltage of the power stage (27 VAC).



AC-Filius-MPS/-100-200-300

Connection adapter AC-Filius-MPS80/-1-IQ

The AK-Filius-MPS80xx connection adapter enables the use of the FiliusACS-x welding controller as a replacement for the proven welding controllers of the MPS803x and MPS8043/1 series. The supply voltage of the FiliusACS-x welding controller is provided with 24 VDC and a separate synchronous voltage. The control system can be operated and parameterized, at the same time, the power circuit can be switched off for system safety and energy saving. The proven welding controllers draw their supply voltage from the synchronous voltage of the power stage (27 VAC).



AC-Filius-MPS80xx

MFP power units (Filius)



Fig. 5-1 *MFP* power unit

Description

The *MFP* medium-frequency power units are intended for connecting to the *FiliusMFS* and *SmartMFS* weld timer module series.

The power units are comparable with single phase power stages, but in MFDC three phase technology. The *MFP* power stages are available in various expansion stages.

The technical data can be found in the "[Appendix - technical data](#)" auf Seite 153

MFP403 - MFP408

Power classes	MFP403L	MFP403W	MFP406L	MFP406W	MFP408L	MFP408W
Mains supply voltage	400 / 440 V 3 ph, 480 V 3 ph					
Maximum output current	250 A	250 A	500 A	500 A	650 A	650 A
Output current @ 20% ED	84 A	112 A	157 A	224 A	302 A	302 A
Output current @ 100% ED	38 A	50 A	70 A	100 A	135 A	150 A
Rated power @ 20% ED	42 kVA	56 kVA	79 kVA	112 kVA	151 kVA	168 kVA
Cooling Media	Air	Water	Air	Water	Air	Water
Gross weight	27 kg	21 kg	27kg	21 kg	27 kg	21 kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L

MFP413 - MFP436

Power classes	MFP413L	MFP413W	MFP416L	MFP416W	MFP424W	MFP436W
Mains supply voltage	400 / 440 V 3 ph, 480 V 3 ph					
Maximum output current	900 A	900 A	1200 A	1200 A	1600 A	2400 A
Output current @ 20% ED	335 A	369 A	447 A	537 A	783 A	1062 A
Output current @ 100% ED	150 A	165 A	200 A	240 A	350 A	475 A
Rated power @ 20% ED	168 kVA	185 kVA	224 kVA	269 kVA	392 kVA	531 kVA
Cooling Media	Air	Water	Air	Water	Air	Water
Gross weight	ca. 30kg	ca. 24 kg	ca. 30 kg	ca. 24 kg	ca. 26 kg	ca. 26 kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	4 l/min 1 gal./ L	4 l/min 1 gal./ L

MFP cables available in different lengths.

Sinius product series

Inverter technology 1 kHz



50/60 Hz thyristor technology



MF transformer [DC]

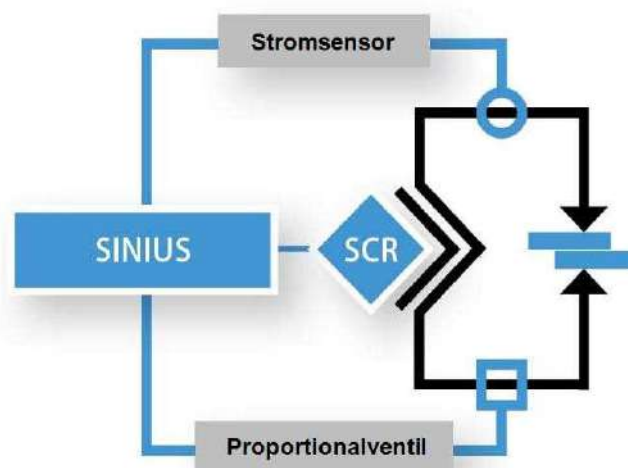
AC transformer [AC, DC]

Description

The Sinius weld processor series is designed to be integrated into your PLC environment. It is suitable for your machine where the weld processor is operated through the machine HMI, say in large mesh welders, customized spot, projection or seam welders.

The units are named processor to indicate that they are integrators since there is no HMI, hardware or software, from HWH. The HMI is designed through the PLC interface.

Sinius is available in AC and MFDC technology.



System structure

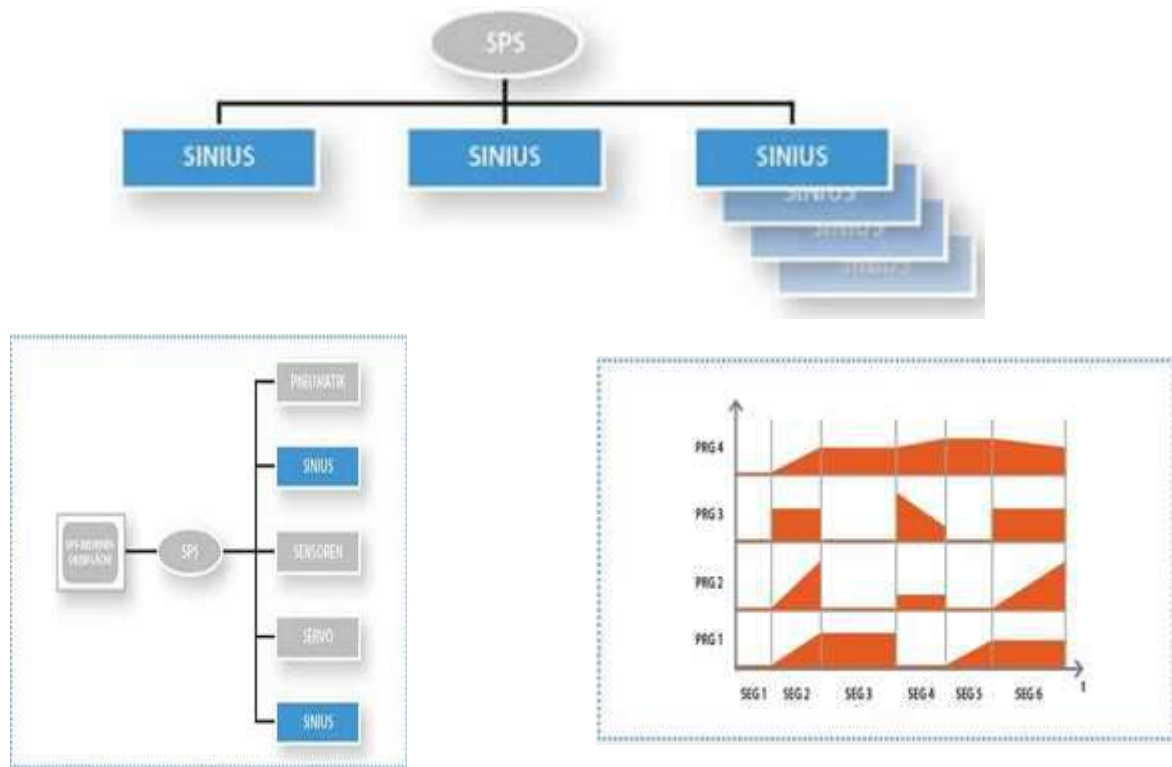


Fig. 6-1 System structure with *Sinius*

Fig. 6-2 Individual welding process

Operating concept

Parameterisation of the Sinius is carried out using a direct connection to the PLC via fieldbus.



Standard function scope:

- 8 internal schedules (unlimited in PLC)
- 10 time segments per schedule or 80 in one schedule
- Secondary current regulation
- Proportional valve output 0-10 V

Your advantages:

- Full integration in PLC environment
- Protect your knowledge
- Suitable for almost any PLC
- Customized weld schedules as needed.

Comparison of functions

Function scope Sinus	HWI	AC1	AC3
Illustrations			
Power unit	Integrated	External	
Welding transformer	1 kHz DC technology	50 Hz/60 Hz AC technology	
Current type	Direct current	Alternating current	Direct current
Non-regulated mode	Yes		
Mains voltage compensation	Yes		
Secondary current regulation	Yes	Yes	No
Regulation	No		
3-phase, concatenated operation	Omitted	No	Yes
3-phase without concatenation	Omitted	Yes	No
Up to 16 modules switchable in a cascade	Omitted	Yes	Yes
8 programs with 10 programmable time segments or 1 program with 80 time segments	Yes		
Machine/robot connection	PBS, PNIe, ECT, CAN		
Dimensions	310x406x245 mm 12x16x9 inch	45x120x135 mm 2x5x5 inch	

SiniusHWI inverters



The SinusHWI is the designated solution for a weld system fully embedded in your PLC environment with tailored HMI on the PLC.

Application:

SiniusHWI covers automated resistance weld applications from spot, cross wire to seam welding including micro joining. The user interface runs on the PLC user interface and can be adapted directly to the welding task. Whether in fast micro-welding in a complex system or as a high-current welding task, everything runs with your own user interface on your PLC.

The customer receives a user interface tailored to its needs or the integrator provides its standard and a solution protecting the knowledge behind.

The SinusHWI covers the entire range of welding inverter power classes available at Harms & Wende. The range starts at 20 kVA and extends up to approx. 7200 kVA due to the possibility of using up to four SlaveHWI inverters.

The SinusHWI cabling has been reduced to a minimum: CANOpen, Profibus or EtherCAT with just one cable.

Your advantages: inexpensive – easy operation – high flexibility.

Remark: The tables cover 400 V and 480 V systems equally. The difference is in the product code:

SiniusHWI408 - 400 V and SiniusHWI508 - 480 V

SiniusHWI403 - SiniusHWI408

Power classes	HWI403L	HWI403W	HWI406L	HWI406W	HWI408L	HWI408W
Power input	400 / 440 V 3 ph, 480 V 3 ph					
Maximum output current	250 A	250 A	500 A	500 A	650 A	650 A
Output current @ 20% ED	84 A	112 A	157 A	224 A	302 A	302 A
Output current @ 100% ED	38 A	50 A	70 A	100 A	135 A	150 A
Rated power @ 20% ED	42 kVA	56 kVA	79 kVA	112 kVA	151 kVA	168 kVA
Cooling media	Air	Water	Air	Water	Air	Water
Gross weight	27 kg	21 kg	27 kg	21 kg	27 kg	21 kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L

HWI413 - SiniusHWI36

Power classes	HWI413L	HWI413W	HWI416L	HWI416W	HWI424W	HWI436W
Power input	400 / 440 V 3 ph, 480 V 3 ph					
Maximum output current	900 A	900 A	1200 A	1200 A	1600 A	2400 A
Output current @ 20% ED	335 A	369 A	447 A	537 A	783 A	1062 A
Output current @ 100% ED	150 A	165 A	200 A	240 A	350 A	475 A
Rated power @ 20% ED	168 kVA	185 kVA	224 kVA	269 kVA	392 kVA	531 kVA
Cooling media	Air	Water	Air	Water	Air	Water
Gross weight	30 kg	24 kg	30 kg	24 kg	26 kg	26 kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	4 l/min 1 gal./ L	4 l/min 1 gal./ L

SiniusHWI2424 - SiniusHWI2432

Power classes	HWI2424W	HWI2432W
Power input	400 / 440 V 3 ph, 480 V 3 ph	
Maximum output current	1900 A	2400 A
Output current @ 20% ED	1006 A	1230 A
Output current @ 100% ED	450 A	550 A
Rated power @ 20% ED	503 kVA	615 kVA
Cooling media	Water	Water
Gross weight	ca. 26 kg	ca. 26 kg
Cooling water requirement	4 l/min 1 gal./ L	4 l/min 1 gal./ L

SiniusHWI440 - SiniusHWI460

Power classes	HWI3x40	HWI3x45	HWI3x60
Power input	400 / 440 V 3 ph, 480 V 3 ph		
Max. output current	2950 A	3500 A	3500 A
Output current @ 20% ED	1733 A	1845 A	2571 A
Output current @ 100% ED	775 A	825 A	1286 A
Rated power @ 20% ED	867 kVA	923 kVA	1286 kVA
Cooling media	W = Water		
Gross weight	75 kg	75 kg	77 kg
Cooling water requirement	6 L/min 1,5 gal./ L	6 L/min 1,5 gal./ L	8 L/min 2 gal./ L

Hallsensor

The Hall sensor is used for current control because, unlike conventional measuring coils, it has the ability to measure pulse currents with virtually no time limit. This outstanding property is used effectively in applications such as seam welding, heating, flash butt welding and compacting.

Measuring range 1 in kA	Measuring range 2 in kA	Diameter sensor	Articelnr.
4	20	125 mm	21483
		165 mm	46750
6	30	125 mm	21258
		165 mm	46751
10	30	125 mm	20932
		165 mm	25472
		305 mm	46752
6	30	305 mm	46753
20	40	305 mm	28061

SinusAC

Welding the elegant way

- Flexible
- Individual

SinusAC works perfect in fast running cross wire welders interlaced or non interlaced. SinusAC is available as as single phase version SinusAC1 including secondary current regulation and three phase DC version called SinusAC3.

SinusAC3 can be used as traditional three phase version or three times single phase version. This allows to ignite up to 48 thyristor stages in one bus link. If more are needed an additional fieldbus link is needed.



SinusAC can be used as an individual station system or in a complex system with maximum flexibility in the structure of the user interface.

- Short familiarisation time
- Individually adaptable
- Integrated in the machine control system

SinusAC is available with constant current regulation with one ignition output (SinusAC1) or without regulation with up to three ignition outputs. SinusAC3 with three ignition outputs also enables welding operations with 3-phase DC current.

The SinusAC cabling has been reduced to a minimum: CANOpen, Profibus or EtherCAT with just one cable to your PLC.

SinusAC also offers the option of cascading up to 16 modules with up to 48 ignition outputs. In this way, the parameterisation of all welding processors can be operated with ease via the cascade's head module.

Any power stages in the Harms & Wende range can be used for the SinusAC. This enables the current range from 45 A to 3700 A (primary) to be covered.

Your advantages: inexpensive – easy operation – high flexibility.

Function module is supplied on the pen drive

Sinius product code

	SiniusHWI	B	U	LL	zzz
Family name					
Model					
<ul style="list-style-type: none"> _ = inverter in design with dimensions 380x310x325 mm / 15x12x13 inch 2 = inverter in design with dimensions 720x310x325 mm / 28x12x13 inch 3 = inverter in design with dimensions 778x389x345 mm / 31x15x14 inch 		2			
		3			
Mains supply voltage					
<ul style="list-style-type: none"> 4 = 400 - 440 V, 50/60 Hz 5 = 480 - 500 V, 50/60 Hz 			4		
			5		
Output classes					
<ul style="list-style-type: none"> 03L = 37 kVA 03W or WA = 50 kVA 06L = 70 kVA 06W or WA = 110 kVA 08L = 100 kVA 08W or WA = 135 kVA 13L = 165 kVA 13W or WA = 195 kVA 16L = 220 kVA 16W or WA = 270 kVA 24W = 385 kVA 36W = 525 kVA 				03L	
				03W[A]	
				06L	
				06W[A]	
				08L	
				08W[A]	
				13L	
				13W[A]	
				16L	
				16W[A]	
				24W	
				36W	
<i>available in model 2</i>					
<ul style="list-style-type: none"> 24W = 500 kVA 32W = 625 kVA 40W = 900 kVA 				24W	
				32W	
				40W	
<i>available in model 3</i>					
<ul style="list-style-type: none"> 45W = 950 kVA 60W = 1300 kVA 				45W	
				60W	
Machine and robot connections					
<ul style="list-style-type: none"> See machine and robot connections table "Machine and robot connections" <i>Auf der gegenüberliegenden Seite</i> 					-zzz
<ul style="list-style-type: none"> L = Air cooled W = water cooled inside enclosure WA = water outside enclosure 					

	SiniusAC	D	zzz
Family name			
System designation			
<ul style="list-style-type: none"> • 1 = alternating current, 1-phase, 50/60 Hz, with regulation • P = alternating current, 1-phase, 50/60 Hz, with primary current regulation • 3 = alternating current, 3-phase, 120° coupling, 50/60 Hz, without regulation 		1	
		P	
		3	
Machine and robot connections			
<ul style="list-style-type: none"> • See machine and robot connections table "Machine and robot connections" unten 			

	Machine and robot connections		-zzz	
Machine and robot connections				
<ul style="list-style-type: none"> • PBS = Profibus DP electrical • PNle = Profinet electrical • ECT = EtherCAT • CAN = CANOpen 				
				PNle
				ECT
				CAN

AnalogHWI product series



Fig. 7-1 *AnalogHWI* inverter

Description

The AnalogHWI medium-frequency inverter is a power unit for operating a medium-frequency welding transformer in corresponding welding systems. The nominal value for the welding current is specified using an analogue input running between 0 and 10 V. The user is therefore provided with a simple interface with which the current level and the main current time can be set. The welding processes can therefore be designed individually.

Operating areas include spot and seam welding machines as well as heat applications.

AnalogHWI inverters become part of the PLC system and are triggered by 24 V IO hardwiring and the analog input - simple as is.

Our AnalogHWI inverters are available in the full power range from 100 A to 3500 A max output current. Output current can be amplified by a master-slave combination of one master up to three slaves.

All AnalogHWI inverters come with the well proven secondary current regulation (CCR) with a weld time up to seven seconds. When longer times are required as in a seam weld or heating process a Hall sensor is added for unlimited regulation times.

The technical data can be found in the "[Appendix - technical data](#)" auf Seite 153

AnalogHWI403 - AnalogHWI408

Power classes	HWI403L	HWI403W	HWI406L	HWI406W	HWI408L	HWI408W
Mains supply voltage	400 / 440 V 3 ph, 480 V 3 ph					
Maximum output current	250 A	250 A	500 A	500 A	650 A	650 A
Output current @ 20% ED	84 A	112 A	157 A	224 A	302 A	302 A
Output current @ 100% ED	38 A	50 A	70 A	100 A	135 A	150 A
Rated power @ 20% ED	42 kVA	56 kVA	79 kVA	112 kVA	151 kVA	168 kVA
Cooling Media	Air	Water	Air	Water	Air	Water
Gross weight	21 kg	21 kg	21 kg	27 kg	21 kg	27 kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L

AnalogHWI413 - AnalogHWI36

Power classes	HWI413L	HWI413W	HWI416L	HWI416W	HWI424W	HWI436W
Mains supply voltage	400 / 440 V 3 ph, 480 V 3 ph					
Maximum output current	900 A	900 A	1200 A	1200 A	1600 A	2400 A
Output current @ 20% ED	335 A	369 A	447 A	537 A	783 A	1062 A
Output current @ 100% ED	150 A	165 A	200 A	240 A	350 A	475 A
Rated power @ 20% ED	168 kVA	185 kVA	224 kVA	269 kVA	392 kVA	531 kVA
Cooling Media	Air	Water	Air	Water	Air	Water
Gross weight	24 kg	30 kg	24 kg	30 kg	26 kg	26kg
Cooling water requirement	-	4 l/min 1 gal./ L	-	4 l/min 1 gal./ L	4 l/min 1 gal./ L	4 l/min 1 gal./ L

AnalogHWI2424 - AnalogHWI2432

Power classes	HWI2424W	HWI2432W
Mains supply voltage	400 / 440 V 3 ph, 480 V 3 ph	
Maximum output current	1900 A	2400 A
Output current @ 20% ED	1006 A	1230 A
Output current @ 100% ED	450 A	550 A
Rated power @ 20% ED	503 kVA	615 kVA
Cooling Media	Water	Water
Gross weight	ca. 26 kg	ca. 26 kg
Cooling water requirement	6 L/min 1 gal./ L	4 l/min 1 gal./ L

AnalogHWI440 - AnalogHWI460

Power classes	HWI3x40	HWI3x45	HWI3x60
Mains supply voltage	400 / 440 V 3 ph, 480 V 3 ph		
Maximum output current	2950 A	3500 A	3500 A
Output current @ 20% ED	1733 A	1845 A	2571 A
Output current @ 100% ED	775 A	825 A	1286 A
Rated power @ 20% ED	867 kVA	923 kVA	1286 kVA
Cooling Media	W = Water		
Gross weight	75 kg	75 kg	77 kg
Cooling water requirement	6 L/min 1,5 gal./ L	6 L/min 1,5 gal./ L	8 L/min 2 gal./ L

Hallsensor

The Hall sensor is used for current control because, unlike conventional measuring coils, it has the ability to measure pulse currents with virtually no time limit. This outstanding property is used effectively in applications such as seam welding, heating, flash butt welding and compacting.

Measuring range 1 in kA	Measuring range 2 in kA	Diameter sensor	Articelnr.
4	20	125 mm	21483
		165 mm	46750
6	30	125 mm	21258
		165 mm	46751
10	30	125 mm	20932
		165 mm	25472
		305 mm	46752
6	30	305 mm	46753
20	40	305 mm	28061

AnalogHWI product code / order designation

	AnalogHWI	B	U	LL
Family designation / device name	[Diagram: A horizontal line from the 'AnalogHWI' column to the 'B' column, and a vertical line from the 'B' column to the 'U' column.]			
Design	[Diagram: A horizontal line from the 'AnalogHWI' column to the 'B' column, and a vertical line from the 'B' column to the 'U' column.]			
<ul style="list-style-type: none"> _ = MF power unit, small design (dimensions = 380x310x325 mm) 2 = MF power unit, design (dimensions = 720x310x325 mm) 3 = MF power unit, design (dimensions = 778x389x345 mm) 		2 3		
Supply voltage	[Diagram: A horizontal line from the 'AnalogHWI' column to the 'U' column, and a vertical line from the 'U' column to the 'LL' column.]			
<ul style="list-style-type: none"> 4 = 400 - 440 V, 50/60 Hz 5 = 480 - 500 V, 50/60 Hz 			4 5	
Output classes	[Diagram: A horizontal line from the 'AnalogHWI' column to the 'LL' column, and a vertical line from the 'LL' column to the 'U' column.]			
<ul style="list-style-type: none"> 03L = 37 kVA 03W or WA = 50 kVA 06L = 70 kVA 06W or WA = 110 kVA 08L = 100 kVA 08W or WA = 135 kVA 13L = 165 kVA 13W or WA = 195 kVA 16L = 220 kVA 16W or WA = 270 kVA 24W = 385 kVA 36W = 525 kVA 				03L 03W[A] 06L 06W[A] 08L 08W[A] 13L 13W[A] 16L 16W[A] 24W 36W
<i>Available in design 2</i>				
<ul style="list-style-type: none"> 24W = 500 kVA 32W = 625 kVA 				24W 32W
<i>Available in design 3</i>				
<ul style="list-style-type: none"> 40W = 900 kVA 45W = 950 kVA 60W = 1300 kVA 				40W 45W 60W

AnalogHWI inverter technical data

Please refer to the tabular lists in the Appendix for the electrical and mechanical technical data.

SlaveHWI product series

GeniusHWI slave operation

Slave operation is particularly suitable for applications requiring a higher welding current. Systems with an output current of 250 kA have proved suitable in practice.

The master operates e.g. as a GeniusHWI-Basic or GeniusHWI-Professional in the usual manner but additionally undertakes control of the connected slave inverters. The system messages of each connected slave inverter are monitored here, leading to overall system shut-off in the event of an error.

The slave inverter consists of a power unit and the actuation electronics of the power IGBTs. Signal amplification is also integrated into the slave inverter. It is therefore a parallel power stage. Up to 5 inverters can be switched in parallel. If more than five inverters are required, an additional power amplifier is necessary.

When constructing the machine, it must be ensured that the resistance conditions of the connections to the MF transformers are identical. I.e. the connection lines of the individual MF transformers must have the same line lengths and cross-sections. This ensures the occurrence of even current distribution to the transformers and inverters.



Accessory cable: VK33 (master-slave connection cable). The "Slave" option is not included in the product code and must be ordered separately.

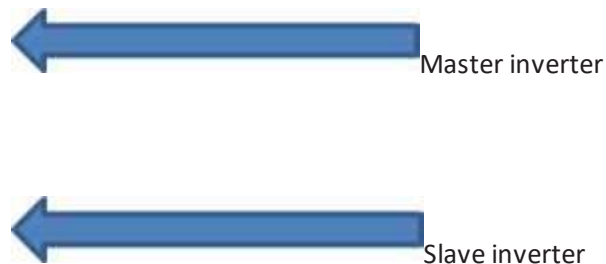


Fig. 8-1 Control cabinet with GeniusHWI master/slave

SiniusHWI slave operation

Slave operation is particularly suitable for applications requiring a higher welding current. Systems with an output current of 250 kA have proved suitable in practice.

The SiniusHWI undertakes controlling of the connected slave inverters. The system messages of each connected slave inverter are monitored here, leading to overall system shut-off in the event of an error.

The slave inverter consists of a power unit and the actuation electronics of the power IGBTs. Signal amplification is also integrated into the slave inverter. It is therefore a parallel power stage. Up to six inverters can be switched in parallel. If even more power is required, an additional power amplifier is necessary.

When constructing the machine, it must be ensured that the resistance conditions of the connections to the MF transformers are identical. I.e. the connection lines of the individual MF transformers must have the same line lengths and cross-sections. This ensures the occurrence of even current distribution to the transformers and inverters.

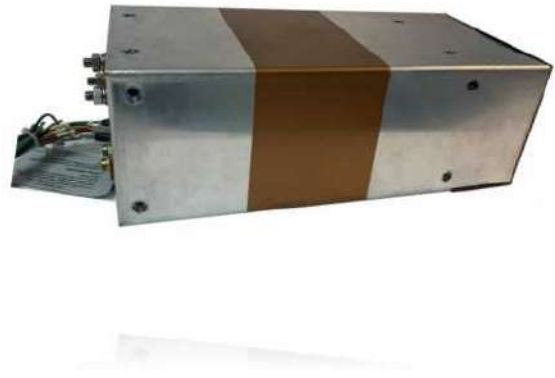


Fig. 8-2 Special system: maximum welding current 300 kA, SiniusHWI 3460 master system with three slave inverters

SlaveHWI product code

	SlaveHWI	B	U	LL
Family designation / device name	[Diagram: A horizontal line from SlaveHWI to B, and a vertical line from B to U]			
Design	[Diagram: A horizontal line from SlaveHWI to B, and a vertical line from B to U]			
<ul style="list-style-type: none"> • _ = MF inverter, small design (dimensions = 380x310x325 mm) • 2 = MF inverter, design (dimensions = 720x310x325 mm) • 3 = MF inverter, design (dimensions = 778x389x345 mm) 		2 3		
Supply voltage	[Diagram: A horizontal line from SlaveHWI to U, and a vertical line from U to LL]			
<ul style="list-style-type: none"> • 4 = 400 - 440 V, 50/60 Hz • 5 = 480 V, 50/60 Hz 			4 5	
Output classes	[Diagram: A horizontal line from SlaveHWI to LL]			
<ul style="list-style-type: none"> • 16L = 220 kVA • 16W or WA = 270 kVA • 24W = 365 kVA • 36W = 525 kVA 				16L 16W[A] 24W 36W
<i>Available in design 2</i>				
<ul style="list-style-type: none"> • 24W = 500 kVA • 32W = 625 kVA 				24W 32W
<i>Available in design 3</i>				
<ul style="list-style-type: none"> • 36W = 525 kVA • 40W = 900 kVA • 45W = 950 kVA • 60W = 1300 kVA 				36W 40W 45W 60W

Weld transformers



Description

The selection of a welding transformer as a vital element for providing the high currents required for welding necessitates precise coordination with the application.

Depending on the welding inverter's output class, one or two transformers are used. The transformation ratio determines the secondary voltage in the welding current circuit.

A maximum welding current arises depending on the duty cycle determined by the joining process.

Integrated sensors for current and temperature measurement are fitted as standard.

Recommendations

The MF welding transformers are intended for use with machines and guns according to DIN/ISO.

The inverter equipment can be found in the corresponding product series. The inverter power classes are assigned to the Genius, Filius and Sinius product series.

Standard equipment of MF welding transformers:

- Primary voltage 500 V, 1000 Hz
- Attached rectifier set
- Integrated current measurement coil
- Temperature monitoring for transformer and diodes
- Other transformers and terminal boxes on request
- Open design
- All MF transformers are available without connection housing

Optional equipment:

- Transformers also available in 600 V (for 480 V mains)
- Encapsulated version

MF transformer suggestion for inverter power class Genius-, SiniusHWI403 and MFP403

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 33 kVA (at 6 V)	3.5/4.5/6.0 - 1.5/2 V	Approx. 3 kA	Approx. 5 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI406 and MFP406

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 33 kVA (at 6 V)	3.5/4.5/6.0 - 1.5/2 V	Approx. 3 kA	Approx. 5 kA
Transformer – 80 kVA	6.3 - 6/2 V	Approx. 12 kA	Approx. 18 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI408 and MFP408

MF transformer suggestion for inverter power class Genius-, SiniusHWI408 and MFP408			
Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 80 kVA	6.3 - 6/2 V	Approx. 12 kA	Approx. 18 kA
Transformer – 90 kVA	8.3 - 6/2 V	Approx. 12 kA	Approx. 18 kA
Transformer – 130 kVA	9.4 - 10/2 V	Approx. 14 kA	Approx. 21 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI413 and MFP413

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 130 kVA	9.4 - 11/2 V	Approx. 14 kA	Approx. 26 kA
Transformer – 180 kVA	9.0 - 6/4 V	Approx. 20.0 kA	Approx. 30 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI416 and MFP416

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 130 kVA	9.4 - 11/2 V	Approx. 14 kA	Approx. 26 kA
Transformer – 180 kVA	9.0 - 6/4 V	Approx. 20.0 kA	Approx. 30 kA
Transformer – 250 kVA	11.8 - 6/4 V	Approx. 21.2 kA	Approx. 28 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI424 and MFP424

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 250 kVA	11.8 - 6/4 V	Approx. 21.2 kA	Approx. 28 kA
Transformer – 250 kVA	13.2 - 6/4 V	Approx. 19 kA	Approx. 28 kA
Transformer – 300 kVA	16.0 - 6/4 V	Approx. 18 kA	Approx. 28 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI436 and MFP436

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 300 kVA	8.9 - 13/2 V	Approx. 21.2 kA	Approx. 51 kA
Transformer – 500 kVA	13.2 - 13/2 V	Approx. 29 kA	Approx. 51 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI3440

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 300 kVA	8.9 - 13/4 V	Approx. 21.2 kA	Approx. 51 kA
Transformer – 500 kVA	13.2 - 13/4 V	Approx. 29 kA	Approx. 51 kA
Transformer – 600 kVA	17.0 - 13/4	Approx. 29 kA	Approx. 51 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI3445

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 700 kVA	17.2 - 13/6 V	Approx. 42 kA	Approx. 75 kA
Transformer – 900 kVA	13.2 - 10/8 V	Approx. 56 kA	Approx. 78 kA

MF transformer suggestion for inverter power class Genius-, SiniusHWI3460

Rated power at 20% ED	Sec. voltage – Diode type/number	Welding current at 20% ED	Welding current At 5% ED
Transformer – 900 kVA	17.0 - 10/8 V	Approx. 56 kA	Approx. 78 kA
Transformer – 1200 kVA	17.0 - 13/8 V	Approx. 58 kA	Approx. 100 kA

Cable for feeding the welding case			
Article number	Cable	Length	Cross section
38697	Primary cable to the weld enclosure	3m	4mm ²
49904	Primary cable to the weld enclosure	3m	16mm ²
51110	Primary cable to the weld enclosure	3m	25mm ²

Primary cable for connecting the inverter to the MF transformer			
Article number	Cable	Length	Cross section
44403	Primary cable to the weld transformer	1,5m	4mm ²
41965	Primary cable to the weld transformer	2,5m	16mm ²
4xxxx	Primary cable to the weld transformer	1,5m	25mm ²
49906	Primary cable to the weld transformer	2,5m	25mm ²
51112	Primary cable to the weld transformer	2,5m	25mm ²

Welding transformer accessories

Article	Designation	Description
16265	Connection housing	Rear transformer housing complete with large cover for installation of 180 A MCC plug in the cover or installation of 135 A MCC socket at the side in the housing
16266	Connection housing	Rear transformer housing complete with two-part cover for installation of 135 A MCC plug in the cover
12112	Thermal contact	Replacement thermal contact for the diode package
12111	Measurement coil*	Replacement measurement coil for MF transformer 80/90 kVA
	Measurement coil*	Replacement measurement coil for MF transformer 180/250 kVA
25024	Protective resistor	Fault current protective resistor 1 kOhm

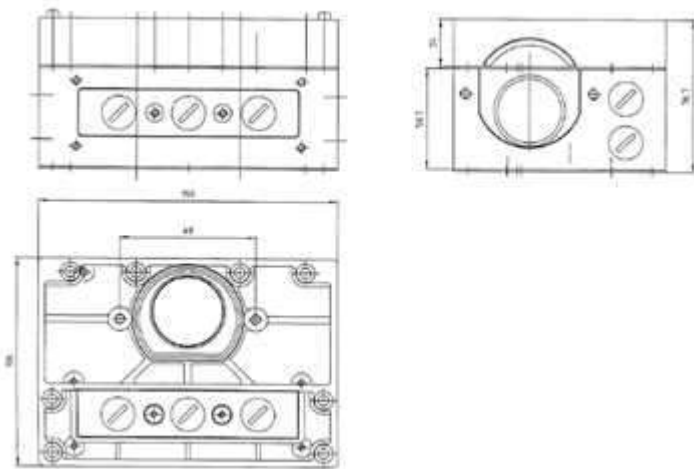


Fig. 9-1 Connection housing 16265

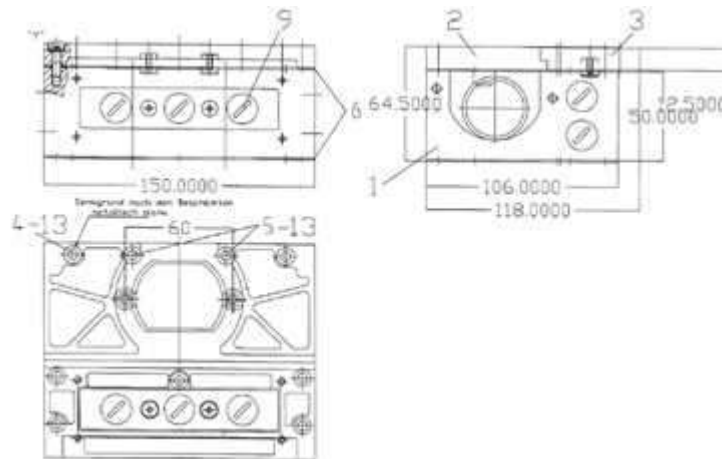


Fig. 9-2 Connection housing 16266

Mains frequency systems

Sinus	MPS10	Ratia43α
 <p>The Sinus control unit is a vertical, light grey metal cabinet. It features a top section with a digital display and several indicator lights. Below the display are two large red emergency stop buttons. The bottom section contains a power switch and various connection ports.</p>	 <p>The MPS10 control unit is a horizontal, light grey metal cabinet. It has a central digital display showing '15P'. The panel is filled with numerous buttons and indicators, including a large red emergency stop button on the left. The HWH logo and 'MPS10' model name are visible at the bottom.</p>	 <p>The Ratia43α control unit is a horizontal, light grey metal cabinet. It features a central digital display and several buttons on the right side. The HWH logo and 'Ratia43α' model name are visible at the bottom.</p>
Filius	Ratia73	GeniusACS
 <p>The Filius control unit is a vertical, white metal cabinet. It has a large blue digital display at the top. Below the display is a prominent red emergency stop button with a white 'X' symbol. The HWH logo and 'Filius' model name are visible at the bottom.</p>	 <p>The Ratia73 control unit is a vertical, blue metal cabinet. It features a digital display showing '88'. The panel is densely packed with buttons and indicators. The HWH logo and 'Ratia73' model name are visible at the top.</p>	 <p>The GeniusACS control unit is a vertical, grey metal cabinet. It has a digital display and several buttons at the top. The HWH logo and 'GeniusACS' model name are visible on the side panel.</p>

Description

Harms & Wende offers a broad range of individual solutions for each mains frequency welding application. From the proven MPS10 welding control system for simple operation and actuation of 1-phase welding machines to the Ratia73 with fieldbus connection and parameterisation using the high-performance XPegasus software, we can offer you a product which meets your requirements. Individual options and extension packages offer flexibility with needs-friendly costs. The Harms & Wende mains frequency systems are equally suitable for installing in systems and welding cases. Operation is carried out externally or via an integrated operating concept.

GeniusACS

The GeniusACS mains frequency welding controller is our latest addition to the Genius system, utilizing the full modularity of the Genius system hardware and software and expanding it with a 50/60Hz variant. It is available as a 1-phase and 3-phase version (GeniusACS1 and GeniusACS3). The GeniusAC control unit is available in versions for spot welding, projection welding and compacting and will replace the Ratia control unit in the long term.

Operating concepts

Central operation of up to 40 control units with the XPegasus operating software via Ethernet (not included in the scope of delivery). Decentralized operation of one control unit with Xcomand(not included in the scope of delivery).

Maschinen- und Roboteranbindung

Communication with the machine or robot controller is carried out via the 24 V I/O and fieldbus connection as standard. You can choose from our fieldbus variants.

See: Genius product range - Machine and robot connections

Standard function scope

- 256 Programs
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/O
- Constant current regulation (KSR)
- Proportional valve output 0-10 V
- Electrode management
- Current increase, current decrease
- Regulation range limit
- Secondary current measurement
- voltage measurement
- Mains load limitation control
- ProfiNet-Slave



Fig. 10-1 GeniusACS-unit

Function Scope PRJ (Projection)

The GeniusACS offers you a high level of functionality for projection welding. The "Projection" version is the perfect control unit for your standard machines and is equipped with 24 VI/O and an analog output for the proportional valve as standard. Constant current control, I-Inspector (current) and S-Inspector (travel) are part of the Projection equipment, as is proportional valve control. The control unit is equipped with an EtherNet interface as standard, which you can use to network all devices. Further functional scopes are possible.

Monitoring / Inspectors

I-Inspector (Current)

- Limit value
- Mean envelope value
- Reference envelope value

H-Inspector (stroke)

- Limit value
- Mean envelope value
- Reference envelope value

S-Inspector (distance)

- Component control
- Sink-in distance
- Final dimension

F-Inspector (Force)

- Limit value
- Mean envelope value
- Reference envelope value

Function Scope SPOT

Functions such as constant current control and the I-Inspector for current monitoring are integral components of the Spot version. These are supplemented by the U-Inspector for voltage monitoring, the H-Inspector for monitoring setpoint changes, and the R-Inspector for resistance control. A powerful proportional valve control also enables precise control of the welding parameters. The system is supplemented by electrode management with control of up to 127 counter groups using the familiar stepper functionality.

Monitoring / Inspectors

I-Inspector (Current)

- Limit value
- Mean envelope value
- Reference envelope value

F-Inspector (Force)

- Limit value
- Mean envelope value
- Reference envelope value

U-Inspector (Voltage)

- Limit value
- Envelope curve mean value
- Envelope curve Reference value

R-inspector (resistance)

- Limit value
- Mean envelope value
- Reference envelope value

Options

Depending on the application and welding task, we offer various optional equipment options for our GeniusACS.

BD – component trace

PDD – Process Data Documentation

TT – Trace Tag siehe GeniusHWI

PQS (ready) – preparation for PQS licence

MM1 – Multi Mess 1

MM2 – Multi Mess 2

PQS (ready) – vorbereitet für die Anwendung mit der PQS – Inline Prozess Überwachung

Operation is via the familiar XPegasus PC user interface, which is available in the "Silver", "Gold", 'Platinum compact' and "Platinum" versions.

All HWH power stages can be operated.

Measuring range from 2 - 200 kA.

Cos-Phi setting 0 - 15, setting via XPegasus.

1.Verz.H, 1.Verz.H.n.P. 0 - 100 %, setting via XPegasus.

Here you will find our ["50/60 Hz Power stages" auf Seite 117](#)

Comparison of Spot and PRJ functions

Function scope	GeniusACS SPOT	GeniusACS PRJ
Operating concepts	PC with XPegasus operating software	
Programs	512	256
Current times	3 times, pre, main, post current time	
Current upslope	Yes	
Current downslope	Yes	
Pulses	Yes	
Robot and machine connection	various fieldbus interfaces	
Electrode management	Yes	
Visualisation of the last 10 measured data	Yes	
Secondary current regulation KSR	Yes	
Current limit value monitoring	Yes	
S-Inspector (component contact, sink-in distance, final dimension monitoring)	No	Yes
I-Inspector (current envelope)	Yes	
H-Inspector (control stroke envelope)	No	Yes
U-Inspector (voltage envelope)	Yes	No
R-Inspector (resistance)	Yes	No
F-Inspector (Force)	No	
PQS (PQS-Ready)	optional	
BD - component documentation	optional	
PDD - Process Data Documentation	optional	
TT - Trace Tag	optional	

Produktschlüssel GeniusACS

Familie

Family designation

Welding control for mains frequency
 Dimensions WxHxD 133 x 328 x 130 mm
 Supply voltage 24V DC

System designation

- AC 50/60 Hz 1-phase
- AC 50/60 Hz 3-phase

Function scope

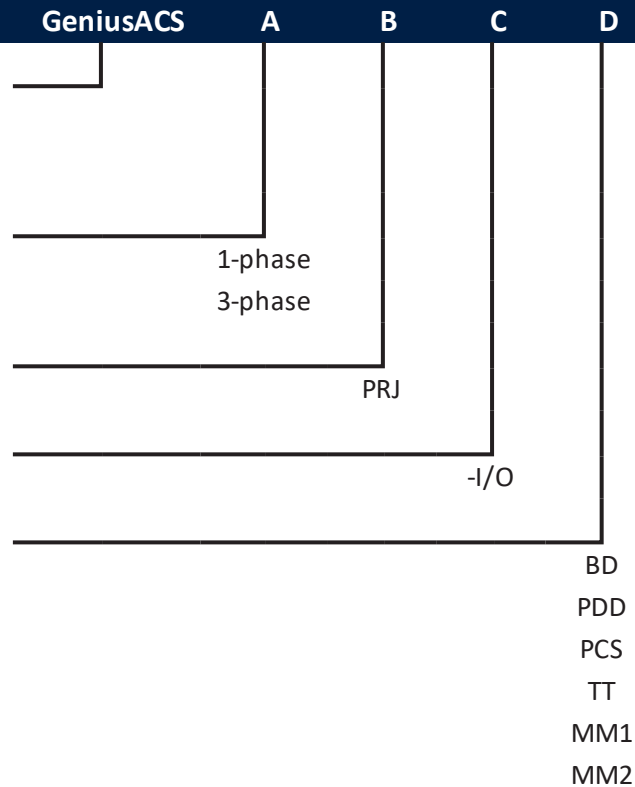
- PRJ = Projection welding

Machine and robot connections

- I/O = 24 V I/O

Optionale Funktionen Genius

- BD = component documentation
- PDD = Process-Data-Documentation
- PQS = -Ready for PQS-Lizenz
- TT = Trace Tag
- MM1 = Multi-Mess 1
- MM2 = Multi-Mess 2



Ratio43/73 and MPK43/73 product series



Fig. 10-2 Ratia73

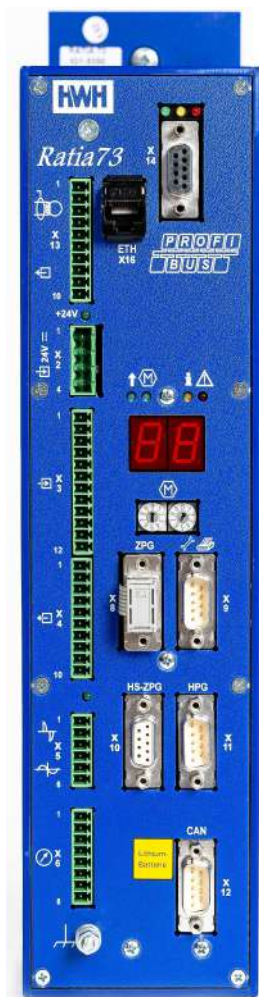


Fig. 10-3 Ratia43

Ratia73 product series

Multi-function welding control system in module form for installation in central control systems or welding cases.

Ratia73 equipment:



- 128 programs
- 128 counter groups
- Current and pressure program
- Electrode wear compensation
- With "linear stepper"
- Electrode management
- Log book function and diagnosis
- Proportional valve actuation
- Automatic 50/60 Hz recognition
- Bus and operating unit connection
- 2 starting functions
- 2 solenoid valve and pre-stroke outputs
- Secondary constant current regulation
- Alternating current
- Current monitoring with adjustable tolerance
- Current monitoring with adjustable spot repetition

Machine and robot interface

- I/O connection via Profibus DP
- I/O connection via Interbus-S electrical or optical

Communication interface

- Ethernet
- RS422
- RS232

Ratia73 special functions

- 10 free current profiles
- Manual programming device HPG-E connectable
- Operation via Mundus operating unit
- Networking and operation via the XPegasus software
- Distance measurement via XPegasus OPC

Ratio73 product codes

	Ratio73	Type	K	L	mm
Family designation	[Line]				
Function type	[Line]				
<ul style="list-style-type: none"> • IQ0 = without regulation and limit value monitoring • IQ1 = with AC regulation and limit value monitoring • IQ2 = with DC regulation and limit value monitoring 		IQ0 IQ1 IQ2			
Communication interface	[Line]				
<ul style="list-style-type: none"> • 0 = no interface • 1 = RS422 interface • 5 = Ethernet interface 			0 1 5		
Machine and robot connection	[Line]				
<ul style="list-style-type: none"> • 1 = 24 V I/O • 3 = Profibus DP electrical • 4 = Interbus S electrical • 5 = Interbus S optical 				1 3 4 5	
Fieldbus protocol	[Line]				
<ul style="list-style-type: none"> • 00 = standard 					00

Ratia43α product series



Fig. 10-4 Ratia43α

Ratia43α standard equipment: multi-function welding control system with integrated operating unit	
Two-line display with plain text display	Automatic 50/60 Hz recognition
Menu guidance	2 starting functions
Function keys	2 x solenoid valve and pre-stroke outputs
Password protection	Rework or milling program
Direct process and error information	Interface for parameter printout
Regulation range limit	Mains voltage compensation
128 programs	Half cycle operation
128 counter groups	I/O connection via 24 V
Current and pressure program	Supply voltage 24 VDC
Proportional valve actuation	
Electrode management (stepper)	
Menu in 3 languages - de, en and fr	

Ratia43α IQ1 additional equipment	Ratia43α special functions
Secondary constant current regulation for alternating current	10 free current profiles
Current monitoring with adjustable spot repetition	Supply voltage 27 VAC
Regulation range monitoring	

Ratia43α IQ2 additional equipment	Options:
Secondary constant current regulation for alternating current	Seam mode with profile indexing, time or event controlled
Current monitoring with adjustable spot repetition	Distance measurement
Regulation range monitoring	

Ratia43 product codes

	Ratia43-Alpha-	Type	K	L	mm
Family designation					
Function type					
<ul style="list-style-type: none"> • IQ0 = without regulation and limit value monitoring • IQ1 = with AC regulation and limit value monitoring • IQ2 = with DC regulation and limit value monitoring 		IQ0 IQ1 IQ2			
Communication interface					
<ul style="list-style-type: none"> • 0 = no interface • 1 = RS422 interface • 5 = Ethernet interface 			0 1 5		
Machine and robot connection					
<ul style="list-style-type: none"> • 1 = 24 V I/O • 3 = Profibus DP electrical • 4 = Interbus S electrical • 5 = Interbus S optical 				1 3 4 5	
Fieldbus protocol					
<ul style="list-style-type: none"> • 00 = standard 					00

Ratia73/43 Connecting cable

Designation	Article no.	Description
MPS VK56	27021-1-03	Cable between Ratia and Power Unit LE26S1 Unit LE100,LE200 Length = 2,0m incl. basic connector set Ratia
MPS VK 18	24047-1-01	Ratia73 Module connection cable RS 422 300 mm
MPS VK63-1.0M	35320	connection cable between weld-controller RATIA43 and power unit LE7/1 LE506 or LE5001 . Incl. matching connectors for control terminals length: 1m
MPS VK63-2.0M	20442	Connecting cable between weld-controller RATIA43/73 and power unit LE7/1 Incl. matching connector for control terminals Length 2,0 m
MPS VK63-5.0M	40849	Connecting cable between weld-controller RATIA43/73 and power unit LE7/1, or LE5001 Incl. matching connectors for control terminals Length 5,0 m
MPS VK63-7.5M	41922	connection cable between weld-controller RATIA43 and power unit LE7/1 LE506 or LE5001 . Incl. matching connectors for control terminals length: 7.5m
MPS VK72	35428	measuring amplifier MPS100 <---> distance sensor Connection cable, length: 5.0m
MPS VK 62	20441	connector cable for RATIA43/73 + measuring belt length: 0.7 m

Ratia73/43 Adapter

Designation	Article no.	Description
MPS VK56	27021-1-03	Cable between Ratia and Power Unit LE26S1 Unit LE100,LE200 Length = 2,0m incl. basic connector set Ratia
MPS VK63-1.0M	35320	connection cable between weld-controller RATIA43 and power unit LE7/1 LE506 or LE5001 . Incl. matching connectors for control terminals length: 1m

Ratia73/43 Zubehör

Designation	Article no.	Description
Power supply Ratia	007102	Power supply 230V / 24V, 20A DC to operate until 10 Ratia73. Separate device for installation in a control cabinet
Messumformer MPS100	29854	for potentiometric sensors (0-10V) type: MPS100.8.050
Messumformer MPX101	34314	The transmitter has a variable variable zero point and end value setting option. The defined partial distance is output as 100% value. The transmitter supplies a highly stable constant voltage to the sensors.voltage as output signals the ranges 0 - 10V and 0 - 20 mA are available.
MB260	0607-MB260	Flexible current measuring belt for measuring secondary currents. Belt diameter 260mm connecting cable 2,5m. 150mVeff/kA with 1kOhm
MWA55	0607-MWA 55	0607-MWA 55 inner diameter 55mm Cabel 2,5 m
Wegsensor 25mm	31049	range 25 mm type 8712-25 for Genius or Filius
Wegsensor 100mm	39603	Displacement button/sensor Measuring range 100mm Type 8710-100
Wegsensor 150mm	32366	RATIA43/73 with displaceament measurement, 150mm 5KOhm, POT.D19mm
Sync. Trafo 27V	30191	Synchronal-Transformer 27 V for Ratia and SiniusAC Input 230V, 400V, 440V, 480V ,500V Output 27V/150mA

Ratia73/43 Spare parts

Designation	Article no.	Description
connector set Profibus	16779	connector set Profibus for option Profibus DP
ASS-RATIA-24VEVA	16775	set counter connectors for basic unit
ASS-RATIA-24VEVA	16778	set counter connectors for 24V I/O

MPS10 product series

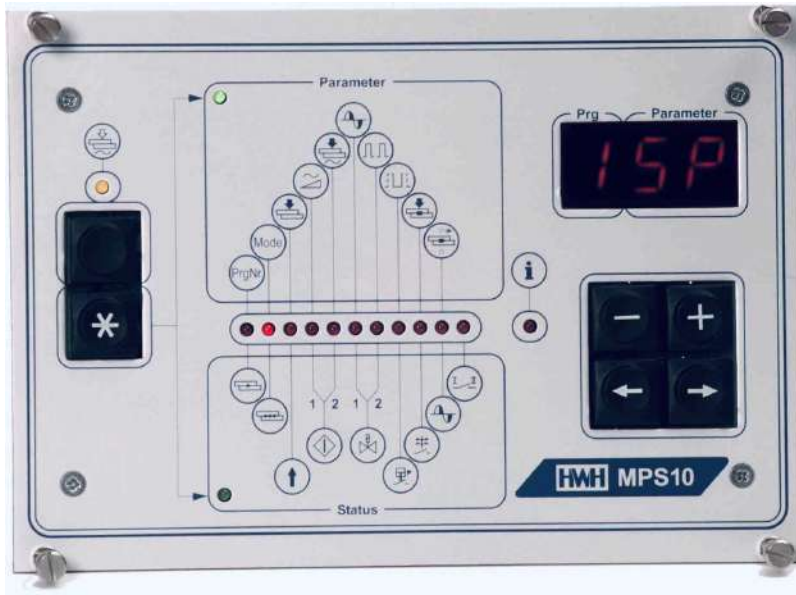


Fig. 10-5 MPS10

Description

The MPS10 welding control system is a programmable 5-time control system for actuating 1-phase welding machines with up to eight welding programs.

All MPS10 control stage operating functions are processed via a clearly arranged control panel.

The primary use of standardised icons for resistance welding devices results in a user-friendly, language-independent interface.

All operating elements required for editing and configuration are located on the front.

The electrical connections required for operation are located at the rear.

The control system offers the following basic features and functions:

Designation	Characteristics
MPS10 MPS10 beta MPS10 alpha	<ul style="list-style-type: none"> • Five-time control system (VHZ, SZ, NHZ, OHZ, PZ) and additional SAZ as well as pulses • Selectable single spot and serial spot operating modes • Eight programs • Two start inputs • Two solenoid valve outputs and one pre-stroke output • Automatic 50/60 Hz recognition • Automatic equalisation of mains voltage fluctuations • Adaptation of the control system and welding processes to welding system conditions • Display of status and error messages during the welding process • With/without "current" switching via button

50/60 Hz Power stages



Description

Power stages are the appropriate addition to our 50/60 Hz welding control systems and an integral element of high-performance welding systems. Various designs are available in terms of input voltage, maximum current and type of cooling. The range is rounded off with 3-phase versions of proven welding thyristors to supplement the 3-phase welding control systems from Harms & Wende.

LE11

The LE11 type is a thyristor output stage in an open chassis design.

It is characterised by its encapsulated electronics, which are protected against splash water.

The E3 discharge resistor integrated on the cooling surface provides indirect water cooling.

It is designed for installation in enclosed control cabinets or machine stands. It contains two thyristors, not connected in parallel, with water cooling and temperature monitoring.

The LE11 power stage is designed for operating all Harms & Wende 50/60 Hz welding control systems. It has no separate mains voltage supply transformer for synchronising the welding control system. This has to be connected separately.

A particularly low-carbon and thus high-impedance plug-in hose should be used as the coolant connection. This hose is mounted on the heat sink fitting without cable clamps.



Basic designation	Additional designation	Current	Voltage to	Cooling
LE 11	250	250 A	500 V	Water
LE 11	700	700 A	500 V	Water
LE 11	900	900 A	500 V	Water
LE 11	1440	1440 A	500 V	Water
LE 11	2335	2335 A	500 V	Water
LE 11	2950	2950 A	500 V	Water
LE 11	3700	3700 A	500 V	Water

LE100 / LE200

Closed power stages

Range of application:

Tyristor power stage for internal cabinet mounting

The power stages for space-saving installation in cabinets with air or water cooling and insulated construction with de-energizing resistor, thyristor control and supply transformer 27 V AC including hand-safe cover.

All-round protection for power thyristors

Sturdy mechanical housings and partially insulated cooling water circuit effectively protect people and equipment from current damage. Unhandy and bulky covers and special hoses with safety length are not necessary. Finger protection, contact protection, tool protection and insulated water cooling system are just a few of the key words that apply to the thyristor power units in this series. Water stays outside!

Thanks to the practical water connection at the rear, there is no need for a hose or pipe connections in the control cabinet when mounted appropriately. The leakage of cooling water into the cabinet is prevented (LE26S1, LE200).

Fig. 11-1



Fig. 11-2 LE26S1-Thyristor power stage



Fig. 11-3 LE100-Thyristor power stage



Fig. 11-4 LE200-Thyristor power stage with cover

LE 100

Basic designation	Additional designation	Current	Voltage to	Cooling
LE100 and LE200	L045	45 A	500 V	Air
LE100 and LE200	L200	200 A	500 V	Air
LE100 and LE200	125	125 A	500 V	Water
LE100 and LE200	580	580 A	500 V	Water
LE100 and LE200	1135	1135 A	500 V	Water
LE26 and LE26S1	280	280 A	500 V	Water
LE26 and LE26S1	580	580 A	500 V	Water

Performance parts in comparison

	LE26 S1	LE100	LE200
Isolated cooling water circuit	Yes		
De-excitation resistor	Yes		
Finger protection / cover	Yes	Hand back safe	
Water cooling outside the cabinet	Yes	No	Yes
Standard nominal voltage	400 V		
Possible nominal voltages	230 / 415 / 440 / 500 V	415 / 440 / 500 V	
Supply voltage for welding controller	27 V		
Suitable for welding control	SinusACx, GeniusACS		

LE7/1

Appropriate for the Ratia73/43, FiliusACS, SiniusAC1 and MPS10 series welding control systems.

For installation in a housing, e.g. on the base plate, with water cooling with type E2 discharge resistor and 27 VAC supply transformer.

Standard connection voltages: 230 V, 400 V, 415 V, 440 V, 500 V.

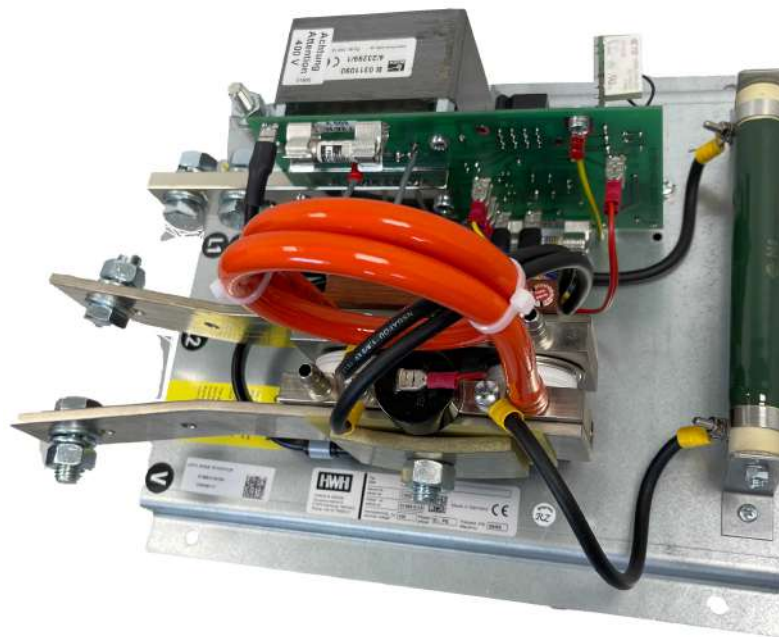


Fig. 11-5 LE7/1

Basic designation	Additional designation	Current	Voltage to	Cooling
LE 7/1	250	250 A	500 V	Water
LE 7/1	700	700 A	500 V	Water
LE 7/1	900	900 A	500 V	Water
LE 7/1	1440	1440 A	500 V	Water
LE 7/1	2335	2335 A	500 V	Water
LE 7/1	2950	2950 A	500 V	Water
LE 7/1	3700	3700 A	500 V	Water

LE10/3

Appropriate for the 3-phase welding control systems Rati73/43 and SinusAC3. For installation in a housing, e.g. on the base plate, with water cooling, type E2 discharge resistors and 27 VAC supply transformer.

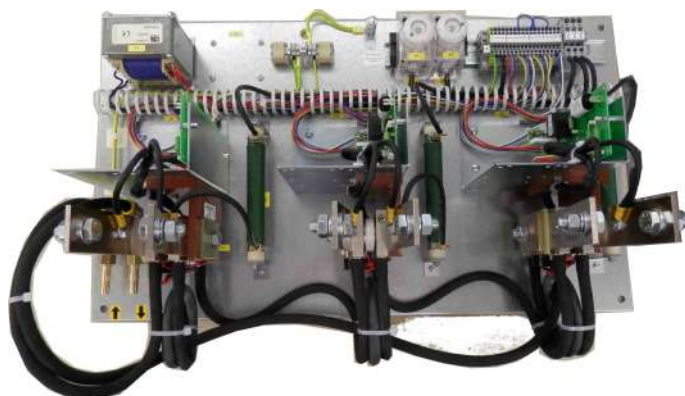


Fig. 11-6 LE10/3

Basic designation	Additional designation	Current	Voltage to	Cooling	Activation
LE 10/3	1440	1440 A	400 V	Water	Star or triangle
LE 10/3	2335	2335 A	400 V	Water	Star or triangle
LE 10/3	2950	2950 A	400 V	Water	Star or triangle
LE 10/3	3700	3700 A	400 V	Water	Star or triangle
LE 10/3	250	250 A	500 V	Water	Star or triangle
LE 10/3	700	700 A	500 V	Water	Star or triangle
LE 10/3	900	900 A	500 V	Water	Star or triangle
LE 10/3	1440	1440 A	500 V	Water	Star or triangle
LE 10-3	2335	2335 A	500 V	Water	Star or triangle
LE 10-3	2950	2950 A	500 V	Water	Star or triangle
LE 10/3	3700	3700 A	500 V	Water	Star or triangle

LE20



Fig. 11-7 LE20 thyristor power stage

Basic designation	Additional designation	Current	Voltage to	Cooling
LE 20	250	250 A	500 V	Water
LE 20	700	700 A	500 V	Water
LE 20	900	900 A	500 V	Water
LE 20	1440	1440 A	500 V	Water
LE 20	2335	2335 A	500 V	Water
LE 20	2950	2950 A	500 V	Water
LE 20	3700	3700 A	500 V	Water

LE20/3



Fig. 11-8 LE20/3 3-phase thyristor power stage

Basic designation	Additional designation	Current	Voltage to	Cooling
LE 20/3	250	250 A	500 V	Water
LE 20/3	700	700 A	500 V	Water
LE 20/3	900	900 A	500 V	Water
LE 20/3	1440	1440 A	500 V	Water
LE 20/3	2335	2335 A	500 V	Water
LE 20/3	2950	2950 A	500 V	Water
LE 20/3	3700	3700 A	500 V	Water

Weld panels



Advantages:

- Individual
- Design as per specified regulations
- Automated control cabinet production through use of an automatic drilling machine
- Designed for the components which are used
- Adaptation of additional add-on parts
- Control cabinet design adapted to your needs
- Pre-defined solution approaches for installing our control system components
- Short delivery times through use of Rittal standard cabinets
- ... and much more

Control cabinets



Fig. 12-1 Representation of SK-SiniusHWI

Description

A control cabinet from Harms & Wende optimally protects the system technology from harmful environmental influences such as dust, water or electromagnetic interference.

The control cabinet also protects the operator from contact with hazardous voltages. Corresponding safety features such as main switches and emergency stop buttons extend the equipment.

Flexible production enables the integration of control and operating units for comfortable parameterisation directly on the system.

The interior can be structured according to the application using corresponding mounting rails and plates. The optional integration of cooling systems protects the valuable components from overheating and failure.

Various connector systems also enable the comfortable and quick connection of external systems. The control cabinet's dimensions depend on the installed components and the customer's requirements. Seamless integration into existing structures is therefore possible.

The standard SK-Genius HWI4yy series control cabinets are prepared with GeniusHWI4xx series Harms & Wende inverters. They are equipped with a main switch and power supply for supplying the undervoltage triggering function.

The GeniusHWI4xx inverters are available in different output variants.

Up to the GeniusHWI 416 (160 kVA), the devices are installed with standard water cooling in Rittal AE1376 type control cabinets (600x760x350 mm). A smaller Rittal AE1360 type cabinet (600x600x350 mm) may also be used for the types with external water (WA) or air cooling (L). The Rittal CM5113 type control cabinet (600x1200x400 mm) is used as of GeniusHWI424.

The cabinets' standard colour is RAL 7035. Other colour variants and options are available subject to a surcharge. A choice of air- and water-cooled variants is available for output classes up to GeniusHWI416.

On request, we will also be happy to offer designs adapted to your specific requirements and wishes.

Top mounted robot cabinets



Fig. 12-2 Top mounted robot cabinet, interior view

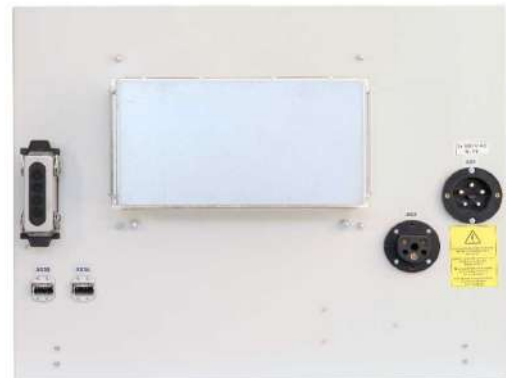


Fig. 12-3 Top mounted robot cabinet, rear view

Description

Our welding cabinets are predestined for typical use in highly automated body production in modern automotive plants. Even the exterior dimensions of the control cabinet are selected to enable simple installation above or directly on a robot control cabinet. Corresponding holes enable secure installation. Various closures are available to offer optimal personal protection. An externally accessible main switch enables disconnection from the mains at any time. A radiator mounted on the rear ensures quiet and low-maintenance dissipation of heat which is generated. As well as the welding inverter and the main switch, many additional options can be integrated into the control cabinet. The choice of connection options at the rear can be implemented as desired by the customer, as can the colour of the overall housing. With our welding case concept for robot applications, we not only comply with European regulations and standards, but can also supply and certify them with components which meet worldwide requirements.

Floor-standing cabinets



Fig. 12-4 Control cabinet with electrode holder changeover



Fig. 12-5 Control cabinet with four inverters

Description

Besides the welding case for mounting on robot cabinets, Harms & Wende also offers customer-specific solutions as floor-standing housings. These are often used for high-power inverters, e.g. for projection welding. Outstanding accessibility of all components is guaranteed. Thanks to the generous installation space inside the control cabinet, with minimal floor space at the same time, additional components such as supply units or switching contactors can be integrated. Floor-standing housings for master-slave systems are a special feature. Several GeniusHWI series inverters are combined in these to achieve welding currents of several 100 kA in the secondary circuit.

The "floor-standing cabinet" housing form is particularly suitable for systems which combine several welding inverters in a tight space, or for projection welding applications in which very high powered inverters are required. Of course, these are also produced according to your specifications and wishes. The same options as for the compact welding cases are available.

Control cabinet solution for projection welding applications



Fig. 12-6 Welding hollow sections

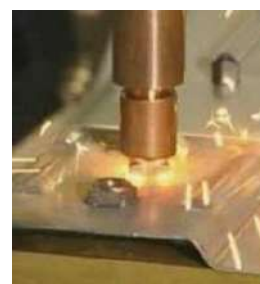


Fig. 12-7 Welding nuts

We recommend the following medium-frequency inverters for these applications:

- Inverter: GeniusHWI416W-EA-PRO
- Cabinet: F-100A-600x760x350 mm
- Complete: SK-GeniusHWI416W-EA-PRO-F-100A-600x760x350

Refer to the data sheets for the relevant inverter output types for the output data.

Technical data:

- 512 programs
- 3 current profiles
- Digital 24 V I/O
- Constant current regulation (KSR)
- Current increase
- Current decrease
- Pulses
- Proportional valve output
- Limit value monitoring
- Stationary operation with XComand operating unit, installed at the front
- IP54 housing
- Supply voltage 3x400 V 50/60 Hz



Control cabinet options

Material	Description
Terminal strip for connections	All connections routed via terminals as an alternative to direct application to the welding control system and the power unit
Mating connectors	Mating connector set for plug connections
Secondary circuit monitoring facilities	Fault voltage monitoring with PFU6
Secondary circuit monitoring facilities	Fault current monitoring with differential current relays
Mains supply output	Service socket
Indicator lamps and buttons	Error, error reset

Accessories

Current and force measuring device TE1700C

The TE1700C is a portable device for measuring the resistance welding parameters. The use of various types of measurement sensors enables measurement of the welding current, the electrode force, the voltage at the electrodes, the energy, the resistance and the heat flux



Fig. 13-1 TE700C

Particularly during the set-up phase, this device offers all information required to configure your individual welding process correctly and optimally. Every technician should therefore have this measuring device to hand for commissioning and service.

Only a measurement reliably ensures that the welding machine or an electrode holder does what meets your requirements. The effects of corrections to the current setting or the air pressure can also be checked immediately.

The colour 5.7" LCD touch screen display ensures precise reading, even under unfavourable conditions.

TE1700C current / force measuring device versions

Designation	Description
TE1700 current with Rogowski belt 1635	Portable current measuring device

Current and force measuring device TE 1700C

Designation	Artikelnr	Description
TE1700C Current	44083	<p>Combinable current, time and force meter with Bluetooth port</p> <p>Current meter version includes: - TE1635 current measuring belt, diameter approx. 160 mm, 150 mV/kA L= 2000mm- Calibration</p>
TE1700C Force	44084	<p>Combinable current, time and force measuring device with Bluetooth port</p> <p>Force measuring device version includes:-</p> <p>TE1675 Force transducer for small electrode distances min. 10 mm Measuring range up to 1,200 daN</p>
TE1700C Current + Force	44074	<p>Combinable current, time and force measuring device with Bluetooth port</p> <p>Current and force measuring device version including:- TE1635 Current measuring belt, diameter approx. 160 mm, 150 mV/kA L= 2000mm- TE1675 Force measuring transducer for small electrode distances min. 10 mm Measuring range up to 1,200 daN- Calibration</p>

Current and force measuring device TE1600

Mobile measurement with know-how. Do you always know how much current your welding machine used to weld the last important order, and does the electrode holder always achieve the desired pressure? With our mobile measuring device TE1600, you always have all data at your disposal.



Fig. 13-2 TE1600 with Rogowski belt and force measuring probe

Particularly during the set-up phase, this device offers all information required to configure your individual welding process correctly and optimally. Every technician should therefore have this measuring device to hand for commissioning and service.

Only a measurement reliably ensures that the welding machine or an electrode holder does what meets your requirements. The effects of corrections to the current setting or the air pressure can also be checked immediately.

The large, clear digital display ensures precise reading, even under unfavourable conditions. Battery operation guarantees the necessary freedom of movement and enables you to work in virtually any location.

Your advantage:

The mobile measuring device TE1600 for controller set-up or random samples ensures production quality and documents the correct function of welding systems. It not only reduces costs but also enables you to work more productively in the future.

Current/force measuring device TE1600 versions

Designation	Description
TE1600 current with Rogowski belt 1635	Portable current measuring device
TE1600 force with force measuring probe 1675	Portable force measuring device, max. 1200 daN
TE1600 multi with Rogowski belt and force measuring probe	Portable current / force measuring device Optional measurement of current (1635) and force (1675)

Extensions	Description
Current measuring belt 1635	Rogowski belt for TE1600, open with quick-action lock, diameter approx. 160 mm
Force measuring probe 1673	Manual force measuring probe for TE1600, max. 200 daN, 10 mm
BNC cable	For connecting an oscilloscope to the TE1600, length 1 m

With our mobile measuring device TE1600, you always have all data at your disposal.

Current-/ force measuring device TE1600

Designation	Article no.	Description
TE 1600 Current	19662	Combinable current, time and force measuring device: Current measuring device version including:- TE1635 Current measuring belt, diameter approx. 160 mm, 150 mV/kA L= 2000mm- Calibration
TE 1600 Force	19663	Combinable current, time and force measuring instrument:Version force measuring instrument including:- TE1675 force transducer for small electrode spacing min. 10 mm Measuring range up to 1.200 daN- Calibration
TE 1600 Current + Force	25420	Combinable current, time and force measuring device Current and force measuring device version including:- TE1635 Current measuring belt, diameter approx. 160 mm, 150 mV/kA L= 2000mm- TE1673 Force measuring transducer for small electrode spacing min. 10 mm Measuring range up to 200 daN- Calibration
TE 1600 Current + Force	19664	Combinable current, time and force measuring device Current and force measuring device version including:- TE1635 Current measuring belt, diameter approx. 160 mm, 150 mV/kA L= 2000mm- TE1675 Force measuring transducer for small electrode spacing min. 10 mm Measuring range up to 1.200 daN- Calibration

TE 1600 extension and spare parts:

Designation	Article no.	Description
TE1673 Force	25419	Force transducer for small electrode spacing min. 10 mm Measuring range up to 200 daN
TE1675 Force	18741	Force transducer for small electrode spacing min. 10 mm Measuring range up to 1,200 daN
TE1662 Force	21675	Force transducer for electrode spacing min. 22 mm Measuring range up to 2.000 daN
TE1663 Force	21382	Force transducer Measuring range up to 10.000 daN
TE1635 Current	25420	Current measuring belt, diameter approx. 160 mm, 150 mV/kA L= 2.000mm

Distance measurement



Fig. 13-3 Distance sensor

Fig. 13-4 Measuring transducer



Fig. 13-5 Distance sensor 100 mm

Article	Designation	Description
31049	Distance sensor 25 mm	Potentiometric distance sensor 25 mm
39603	Distance sensor 100 mm	Potentiometric distance sensor 100 mm
23107	Distance sensor 150 mm	Potentiometric distance sensor 150 mm With ball joint as link
29854	Measuring transducer MPS100	Measuring transducer for potentiometric sensors, 0-10 V, supply voltage 24 VDC
34314	Measuring transducer MPX101	Measuring transducer for potentiometric sensors, 0-10 V, supply voltage 24 VDC, adjustable range.

Netzlastbegrenzungssteuerung

The mains load limitation control NBS-9 is available from 2022 in the UL-ready version and with an English user interface. Mains load limitation controllers are the solution for sites that have a high feed-in requirement due to the number of resistance welding equipment in use. Resistance welding equipment (WSE) requires high power from the mains supply for short periods of time.

If several WSE are connected to one mains supply, the welding processes will overlap in time. The short-time peak loads on the mains supply lead to voltage dips in the supply network, flicker phenomena and higher energy costs. The mains load limitation control (NBS) controls the release of the individual devices. The individual setting options (power, priority, priority time and phase-O PROCON configuration) of each of the 9 possible resistance welding devices ensure that the available mains power is allocated as required. Procon will be pleased to provide further information.



NBS Control

- The following advantages result:
- Reproducible behavior of the network load
- Compliance with the flicker limit values (limit value of the power supply company)
- No deeper voltage dips
- Improved welding quality due to lower voltage dips (operation without regulation, possibly also with constant current regulation)
- Reduction of energy costs (price for peak load of the network - EVU dependent calculation and prices) SIEMENS SIMATIC HMI FLOAD NBS control system
- Cost-optimized installation possible (optimization: cable cross-sections, medium voltage transformer, fuses, ...)
- Symmetrical loading of the medium voltage transformer

Transformer switchover



Fig. 13-6 HWU-3 welding transformer switchover

Description / application

HWU-3 welding transformer switchover enables the operation of several welding transformers on one MF power unit. For example, this enables the execution of two welding tasks in succession either through the use of two welding cylinders or two separate machines.

Switching to the respective channel is carried out via a 24 VDC voltage. Switchover can be controlled from a PLC.

Technical data

Power input	U – V:	MF: 50 – 690 V -15% + 20%
Output voltage	U1 – V1:	Power input – 4 V -10% to +20%
	U2 – V2:	Load- and temperature-dependent
Maximum input and output current [≤ 10 ms]		1200 A For further output currents, see the characteristic curve of the connected inverter
Supply voltage		24 VDC -10% to +20%, 200 mA
Cooling water requirement		6L

HWC-ETH module



Fig. 13-7 HWC-ETH external interface converter for rail mounting (TS35)

The HWC-ETH module is used to connect the HWI24xx inverter series to Ethernet networks. This module is connected directly to an inverter with an EVA or IQR PCB set, and provides an Ethernet socket (RJ-45). The module's delivery scope includes a connection cable.

This cable enables the HWC-ETH module to be supplied and data exchange between the inverter and module. The inverter and HWC-ETH module should be no more than 2 m apart; the enclosed cable is 1.8 m long. This limitation is necessary, as the HWC-ETH module's supply can only be guaranteed over this distance. Using the module within the inverter's control cabinet is recommended. The module's housing requires a connection to the control cabinet's earthing point; a plug connection is available on the rear for this.

Commissioning:

On delivery, the HWC-ETH module is configured with the standard IP address: 192.6.10.95. This address can be changed as desired by the customer via the X^Pegasus user interface. After configuration, the device is connected to the network, and can be accessed within the network structure with the operating software.

Supported inverter function variants (X Pegasus user interface)

Function	Type code	SW version	Note	Restriction
EVA	EVA	9.XX		Connection of the module is only permissible without SA34 and with the enclosed connection cable to the inverter's X3. Interface conversion on systems with Genius, Sinius, analogue and slave functionality is not possible.
IQR	IQR	8.XX		
EVA manual	Manual	8.HX		
IQR manual	IQR manual	8.HX		
EVA-ZP	EVA ZP	8.XX	Pegasus only	
IQR-ZP	IQR ZP	8.XX	Pegasus only	
EVA plus	EVA PLUS	≥ 8.23		

PQS licence

The PQS-Res software licence for data evaluation and analysis is protected with a licence dongle. This is in the form of an SD card, and is inserted into the welding control system on use of the software.

Characteristics of the PQS-Res software, which can be purchased as an option

- Visualisation and logging of the above specified process data
- Extensive signal visualisation options, including comparisons over long periods of time, enable rapid error analysis
- Online monitoring of parameters with immediate error message in the event of process deviations
- Analysis of current process stability
- Long-term data archiving and documentation
- Option of recording or importing external test results
- Operation and data recording can be separated from each other, and can be executed on different PCs

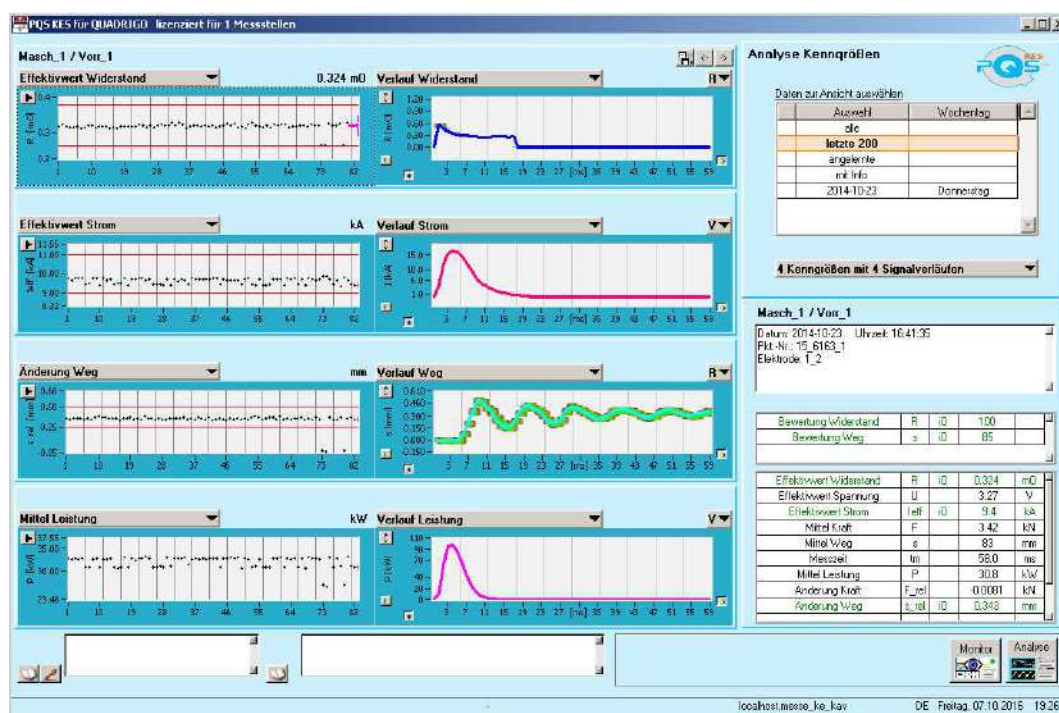


Fig. 13-8 PQS-Res software parameter analysis window

QUADRIGO-Master



Fig. 13-9 QUADRIGO-Master

The QUADRIGO-Master is an industrial PC for space-saving control cabinet installation for industrial use.

The PQS software package for data recording, but also for operating the overall system, can be installed on the QUADRIGO-Master. Of course, QUADRIGO-Master PCs can also be used for other applications, such as e.g. operating the XPegasus software.

Harms & Wende offers various performance classes depending on requirements. The bandwidth ranges from 1 to 16 measuring points, which can be operated with one master.

If constant use in production is intended, we urgently recommend the variants with integrated UPS and external battery pack

Characteristics of the QUADRIGO-Master

- Temperature range 0 to 45°C, passive cooling
- 24 V supply, UPS integrated, external battery
- Windows 7, Intel i5, 4 GB RAM, 320 GB HDD

QUADRIGO-VISU



Fig. 13-10 QUADRIGO-VISU-Plus-V002

The QUADRIGO-VISU is an industrial panel PC with Windows operating system. The PQS software package for system operation and data recording can be installed on the QUADRIGO-VISU. Of course, QUADRIGO-VISU PCs can also be used for other applications, such as e.g. operating the XPegasus software.

QUADRIGO-VISU is available for mounting on a support arm from beneath (19") and as a panel PC for installation in the front of control cabinets (15" and 19").

Depending on version, it offers comfortable touch operation and/or an unbreakable short-stroke keyboard.

The QUADRIGO-VISU is available with an integrated UPS concept for maximum data security. The external battery pack must then be installed in a control cabinet.

Characteristics of the QUADRIGO-VISU

- Dual Ethernet adapter with 2x 100/1000 GB Ethernet
- 1 serial interface RS232 and 4 USB 2.0 ports
- Can be installed in our QUADRIGO box with a QUADRIGO measurement module
- UPS preparation including external battery pack

Please refer to the separate HWH-QST product catalogue for detailed descriptions and equipment features of the QUADRIGO modules.

Academy



Description

As an international company, Harms & Wende offers training courses on site at your premises, at our partners and, of course, also here at our company in Hamburg.

The training courses can usually be conducted in the national language on site or in German and English in Hamburg.

We offer you a clearly structured training program, which can also be adapted to meet your requirements. A selection of possible languages includes Chinese, Hungarian, Romanian, Portuguese (Brazil) and Spanish. Contact us and we will compile a tailored program for you.

Your satisfaction is our success!

On completion of the courses, the participants receive a certificate which documents their participation and describes the contents.

Basic training

The basic training requires no prior knowledge. This training serves as preparation for the system operating personnel. No measures for parameterising the welding task are trained.

If the training participants have a technical background, the course can be shortened by one day.

Training contents	
Basic principles	
<ul style="list-style-type: none"> • Resistance welding • General welding technology 	
Device technology	
<ul style="list-style-type: none"> • Components of the welding technology used 	
Operating software	
<ul style="list-style-type: none"> • System messages • Behaviour in the event of a fault • Who can help me? 	
Duration	3 days
Place	Harms &Wende GmbH & Co. KG Großmoorkehre 9 D-21079 Hamburg
Number of participants	3 to 8 persons

Advanced training

The advanced training requires knowledge of the basic training. This training serves as preparation for set-up staff. After a brief recap of the general welding technology, the basics of parameterising the welding task are trained. The training participants require a technical background.

Training contents	
Basic principles	
<ul style="list-style-type: none"> • Resistance welding • General welding technology • General parameterisation 	
Device technology	
<ul style="list-style-type: none"> • Components of the welding technology used • Behaviour of the control system 	
Operating software	
<ul style="list-style-type: none"> • Basic parameters • Module configuration • Data backup • Inputs/outputs (diagnosis) • System messages • Behaviour in the event of a fault • Who can help me? 	
Duration	2 days
Place	Harms &Wende GmbH & Co. KG Großmoorkehre 9 D-21079 Hamburg
Number of participants	3 to 8 persons

Basic + advanced training

The combined basic and advanced training requires no prior knowledge. This training serves as preparation for the system operating personnel. In addition to the basics, parameterisation of the welding task is trained. If the training participants have a technical background, the course can be shortened by one day.

Training contents	
Basic principles	
<ul style="list-style-type: none"> • Resistance welding • General welding technology • General parameterisation 	
Device technology	
<ul style="list-style-type: none"> • Components of the welding technology used • Behaviour of the control system 	
Operating software	
<ul style="list-style-type: none"> • Basic parameters • Module configuration • Data backup • Inputs/outputs (diagnosis) • System messages • Behaviour in the event of a fault • Who can help me? 	
Duration	4 days
Place	Harms &Wende GmbH & Co. KG Großmoorkehre 9 D-21079 Hamburg
Number of participants	3 to 8 persons

Maintenance training

The maintenance training is aimed at service technicians who have to ensure the operational readiness of the welding components used within the company by exchanging control system components or repairing the devices. Electrical engineering training is a desirable requirement for the participants.

Training contents	
Basic principles	
<ul style="list-style-type: none"> • Resistance welding • General welding technology • General parameterisation 	
Device technology	
<ul style="list-style-type: none"> • Components of the welding technology used • Design, function, components, communication with the PC / device • Communication with the machine • Replacement parts, installation/removal • Design and connections • Software update 	
Operating software	
<ul style="list-style-type: none"> • Basic parameters • System messages • Who can help me? 	
Duration	2 days
Place	Harms &Wende GmbH & Co. KG Großmoorkehre 9 D-21079 Hamburg
Number of participants	3 to 8 persons

Expert training

The expert training provides training on the entire field surrounding the welding task. The trained topics form the prerequisite for internal training within the company. Electrical engineering training is a desirable requirement for the participants.

Training contents	
Basic principles	
<ul style="list-style-type: none"> • Resistance welding • General welding technology • General parameterisation 	
Device technology	
<ul style="list-style-type: none"> • Components of the welding technology used • Device overview • Design, function, components, communication with the PC / device • Communication with the machine • Replacement parts, installation/removal • Design and connections • Software update 	
Operating software	
<ul style="list-style-type: none"> • Basic parameters • Module configuration • Data backup • Inputs/outputs (diagnosis) • Error messages • Behaviour in the event of a fault • Who can help me? 	
Duration	4 days
Place	Harms &Wende GmbH & Co. KG Großmoorkehre 9 D-21079 Hamburg
Number of participants	3 to 8 persons

Key user training

The expert and key user training courses are based on each other. The key users take part in the expert training. After a short while, a two-day key user training course is conducted; this is more or less interactive, and deals with the daily problems faced by key users.

Training contents	
Basic principles	
<ul style="list-style-type: none"> • Resistance welding • General welding technology • General parameterisation 	
Device technology	
<ul style="list-style-type: none"> • Components of the welding technology used • Device overview • Design, function, components, communication with the PC / device • Communication with the machine • Replacement parts, installation/removal • Design and connections • Software update 	
Operating software	
<ul style="list-style-type: none"> • Basic parameters • Module configuration • Data backup • Inputs/outputs (diagnosis) • System messages • Behaviour in the event of a fault • Who can help me? 	
Duration	4 days
Place	Harms &Wende GmbH & Co. KG Großmoorkehre 9 D-21079 Hamburg
Number of participants	3 to 8 persons

Services

Harms & Wende offers a variety of assistance services for resistance welding. Qualified engineers, system specialists or technicians are on hand to provide support in:

- Software creation
- Commissioning
- Customer service calls
- Repairs
- Consulting and remote maintenance

for instance. These services are generally invoiced according to effort. Contact us.

Use of the welding facility or the welding laboratory

Use of a Harms & Wende welding facility	Invoicing unit
Machine hour, use of Harms & Wende welding facility, without provision of a technician	Per hour
Service and machine hour Use of Harms & Wende welding facility, with provision of a technician for operation and parameterisation	Per hour
Machine day, 1 day, 8 h, use of the Harms & Wende welding facility, without provision of a technician	Per day
Service and machine day, 1 day, 8 h, use of the Harms & Wende welding facility with provision of a technician for operation and parameterisation	Per day
Consumables	

Appendix - technical data

The technical data listed here for the inverters refer to the power values of the basic devices in the device profiles

- GeniusHWI
- SiniusHWI,
- SlaveHWI
- MFP

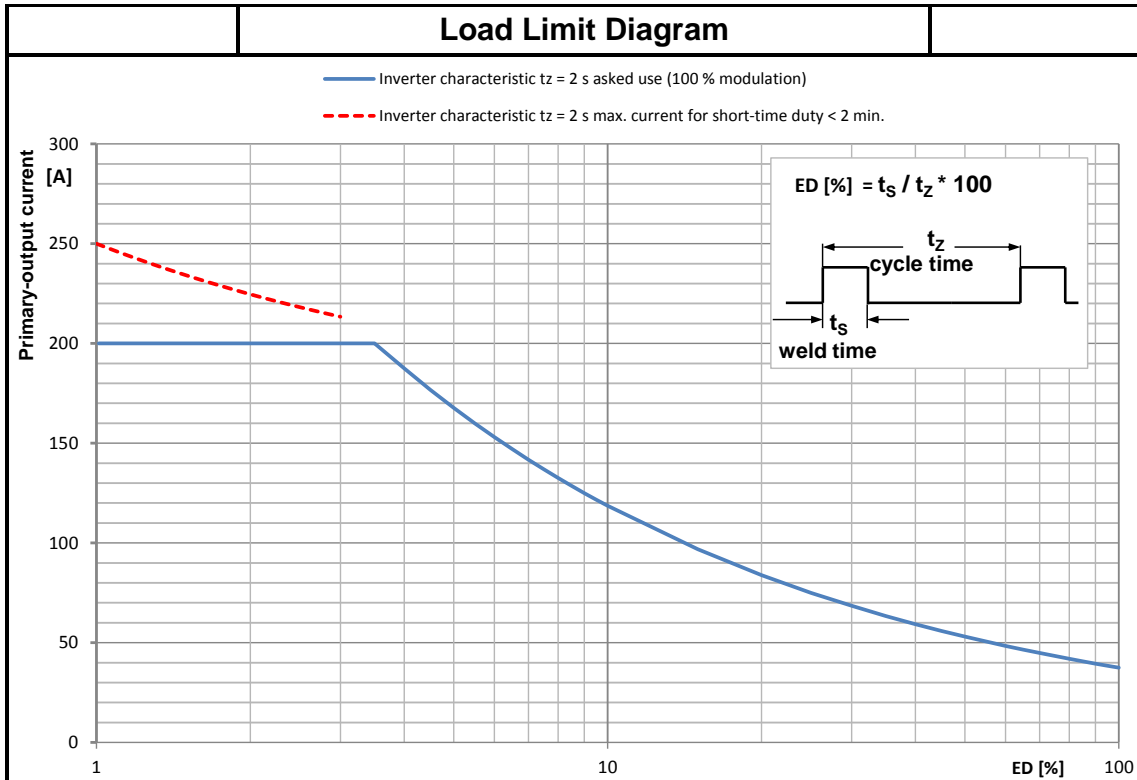
Not all output classes are available in the device profiles.

In output classes HWIx03 to HWIx16, the devices with air cooling, water cooling or external water cooling can be selected.

Only inverters with water cooling are available as of size HWIx24.

Limit value chart x03L

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI403L	HWI503L
Cooling medium		Air	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	42 kVA	
Primary output current	20 % ED ¹⁾	84 A	
Primary output current	100 % ED ¹⁾	38 A	
Max. primay output current	[10 ms]	250 A	
Main nominal current (max. thermal continuous current) ³⁾		27 A	
Cooling water requirements			
Cooling water pressure			
Cooling water connection			
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

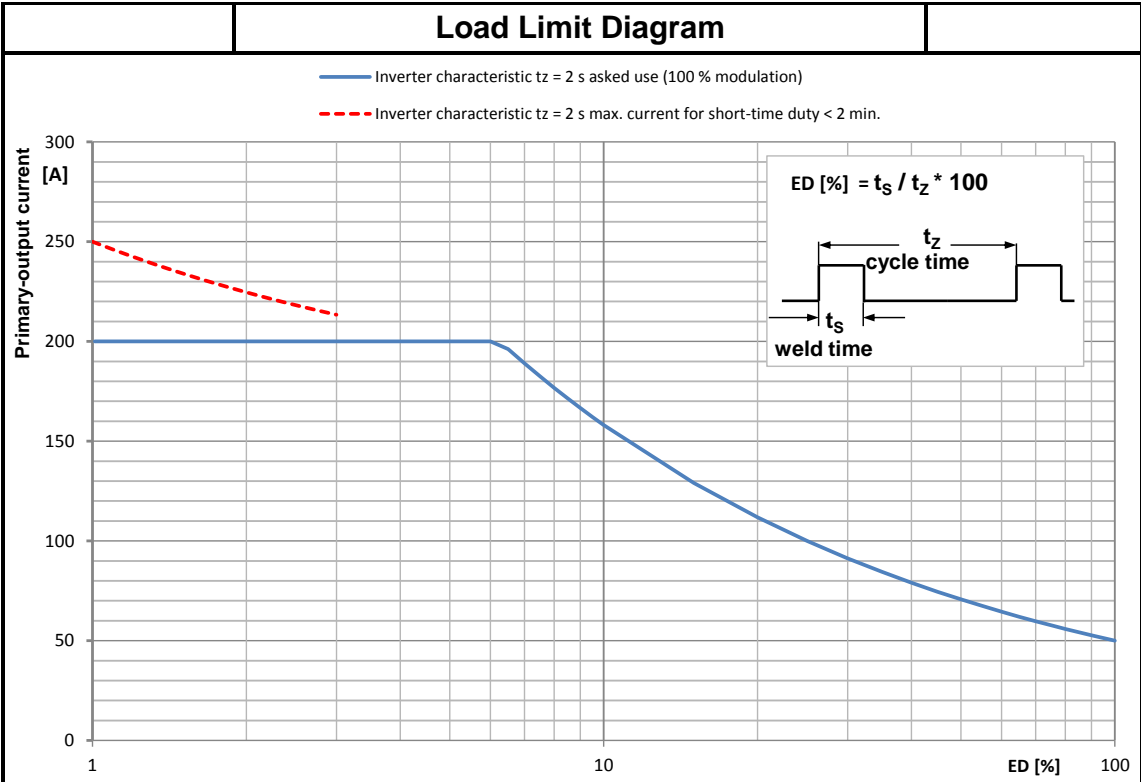
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

 HARMS WENDE	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER 41174-01en	SHEET 1
	DATUM 2017-07-18	2017-07-18		
	NAME Reichardt	Erdmann	TITLE HWI2803L / Genius-, Sinius-, AnalogHWIx03L, MFPx03L	SHEETS 1
	STATUS:			

Limit value chart x03W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

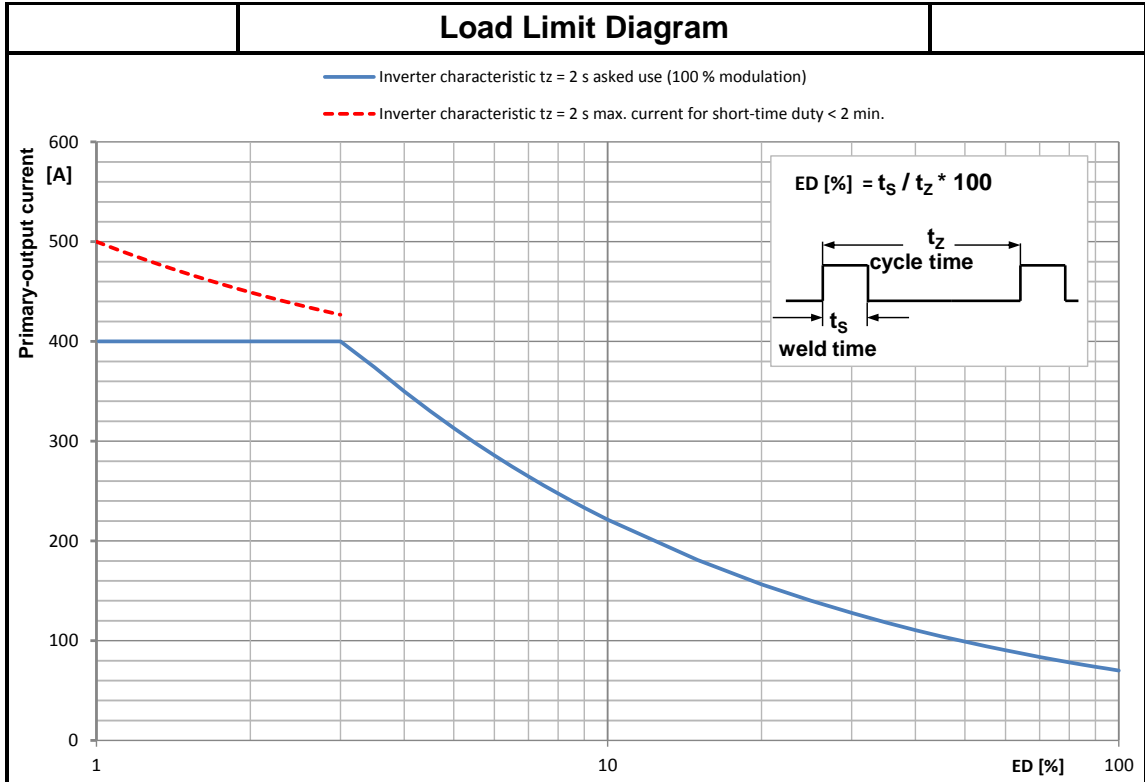
Designation		HWI403W	HWI503W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	56 kVA	
Primary output current	20 % ED ¹⁾	112 A	
Primary output current	100 % ED ¹⁾	50 A	
Max. primay output current	[10 ms]	250 A	
Main nominal current (max. thermal continuous current) ³⁾		35 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.
²⁾ The rated output at 500 V mains voltage is specified.
³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41175-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann	TITLE	HWI2803W / Genius-, Sinius-, AnalogHWIx03W, MFPx03W	SHEETS	1
	STATUS:						

Limit value chart x06L

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

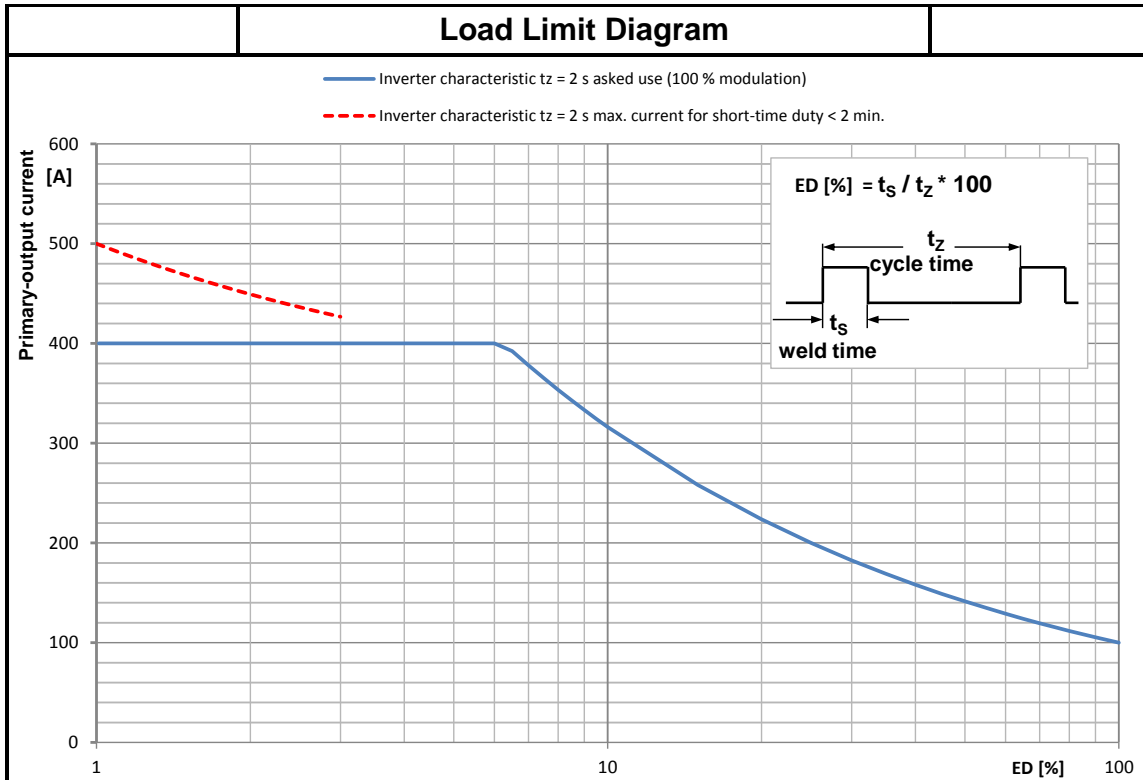
Designation		HWI406L	HWI506L
Cooling medium		Air	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	79 kVA	
Primary output current	20 % ED ¹⁾	157 A	
Primary output current	100 % ED ¹⁾	70 A	
Max. primay output current	[10 ms]	500 A	
Main nominal current (max. thermal continuous current) ³⁾		49 A	
Cooling water requirements			
Cooling water pressure			
Cooling water connection			
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.
²⁾ The rated output at 500 V mains voltage is specified.
³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41178-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann				
	STATUS:			TITLE		SHEETS	1
				HWI2806L / Genius-, Sinius-, AnalogHWIx06L, MFPx06L			

Limit value chart x06W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI406W	HWI506W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	112 kVA	
Primary output current	20 % ED ¹⁾	224 A	
Primary output current	100 % ED ¹⁾	100 A	
Max. primay output current	[10 ms]	500 A	
Main nominal current (max. thermal continuous current) ³⁾		71 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

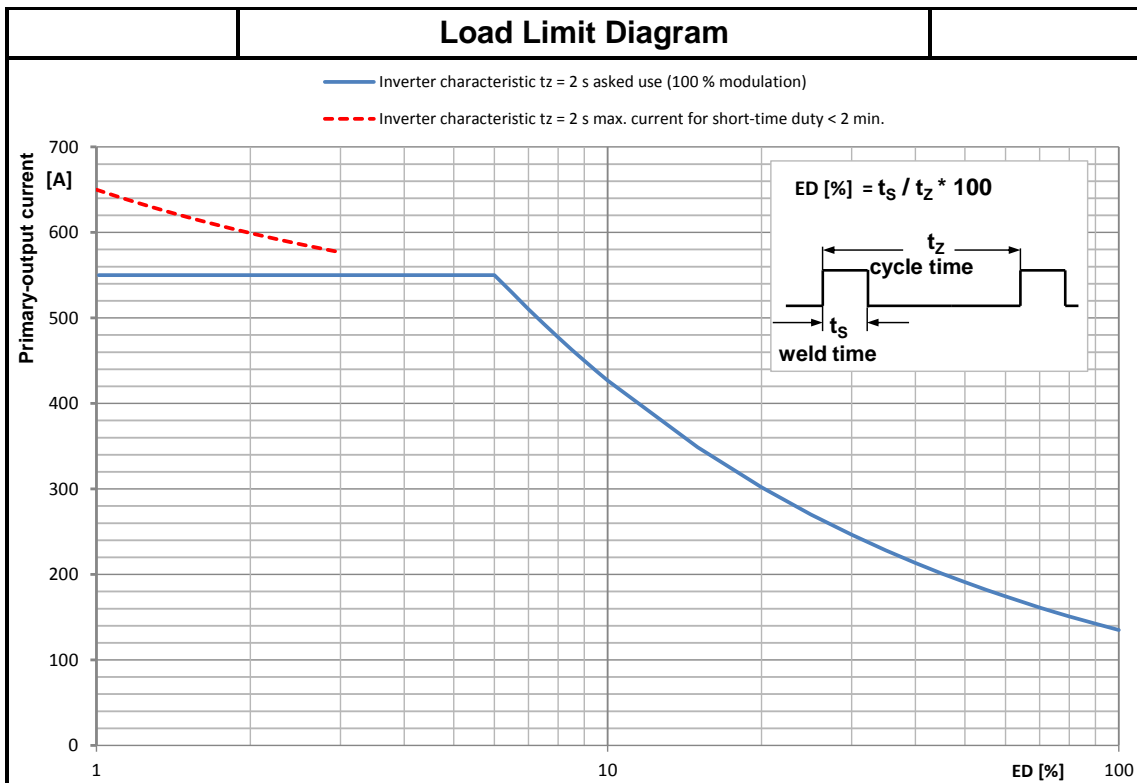
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41179-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann	TITLE	HWI2806W / Genius-, Sinius-, AnalogHWIx06W, MFPx06W	SHEETS	1
	STATUS:						

Limit value chart x08L

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI408L	HWI508L
Cooling medium		Air	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	151 kVA	
Primary output current	20 % ED ¹⁾	302 A	
Primary output current	100 % ED ¹⁾	135 A	
Max. primay output current	[10 ms]	650 A	
Main nominal current (max. thermal continuous current) ³⁾		95 A	
Cooling water requirements			
Cooling water pressure			
Cooling water connection			
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

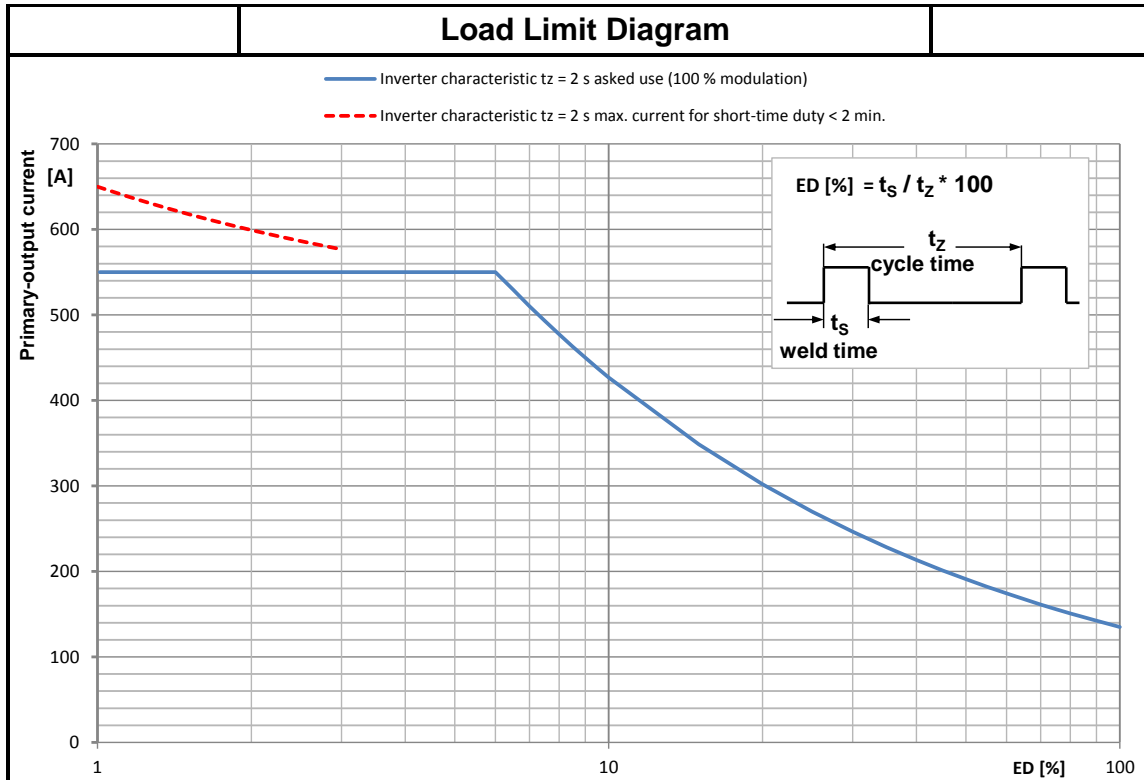
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41180-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann				
	STATUS:			TITLE		SHEETS	1
				HWI2808L / Genius-, Sinius-, AnalogHWIx08L, MFPx08L			

Limit value chart x08W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI408W	HWI508W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	151 kVA	
Primary output current	20 % ED ¹⁾	302 A	
Primary output current	100 % ED ¹⁾	135 A	
Max. primay output current	[10 ms]	650 A	
Main nominal current (max. thermal continuous current) ³⁾		95 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

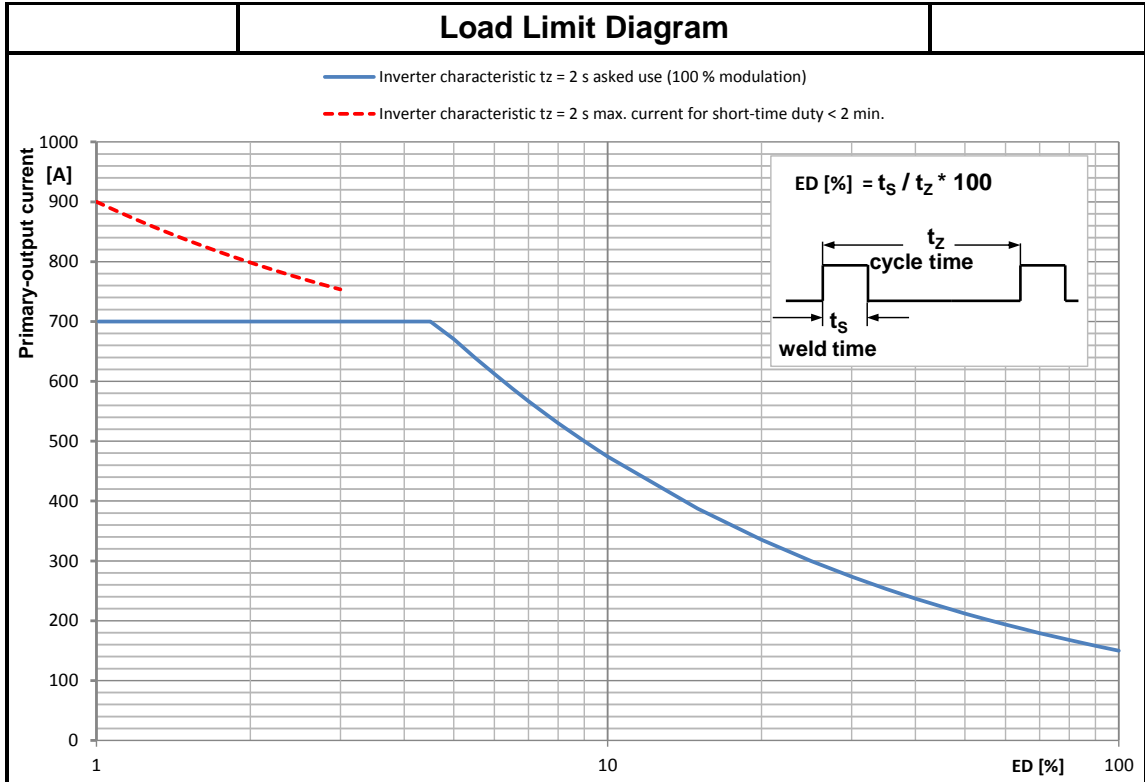
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41181-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann	TITLE	HWI2808W / Genius-, Sinius-, AnalogHWIx08W, MFPx08W	SHEETS	1
	STATUS:						

Limit value chart x13L

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

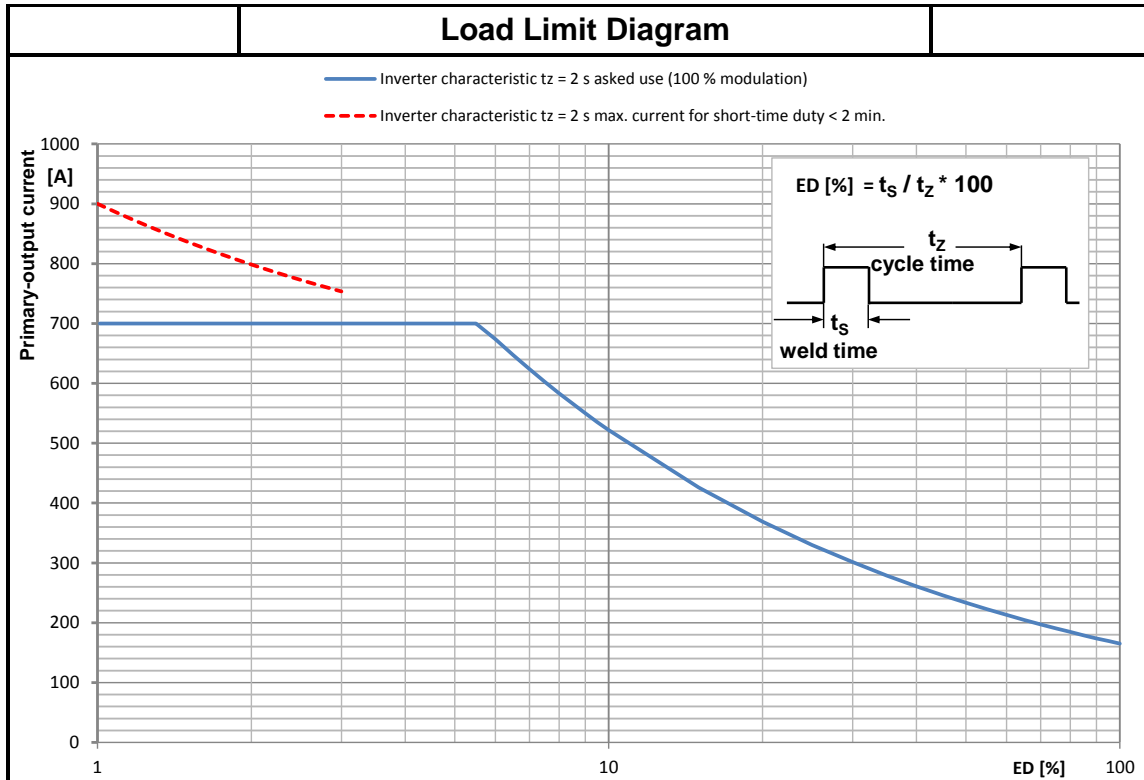
Designation		HWI413L	HWI513L
Cooling medium		Air	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	168 kVA	
Primary output current	20 % ED ¹⁾	335 A	
Primary output current	100 % ED ¹⁾	150 A	
Max. primay output current	[10 ms]	900 A	
Main nominal current (max. thermal continuous current) ³⁾		106 A	
Cooling water requirements			
Cooling water pressure			
Cooling water connection			
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

1) Peak current is specified.
 2) The rated output at 500 V mains voltage is specified.
 3) Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER 41182-01en	SHEET 1
	DATUM 2017-07-11	2017-07-13		
	NAME Reichardt	Erdmann	TITLE HWI2813L / Genius-, Sinius-, AnalogHWIx13L, MFPx13L	SHEETS 1
	STATUS:			

Limit value chart x13W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI413W	HWI513W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	185 kVA	
Primary output current	20 % ED ¹⁾	369 A	
Primary output current	100 % ED ¹⁾	165 A	
Max. primay output current	[10 ms]	900 A	
Main nominal current (max. thermal continuous current) ³⁾		117 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

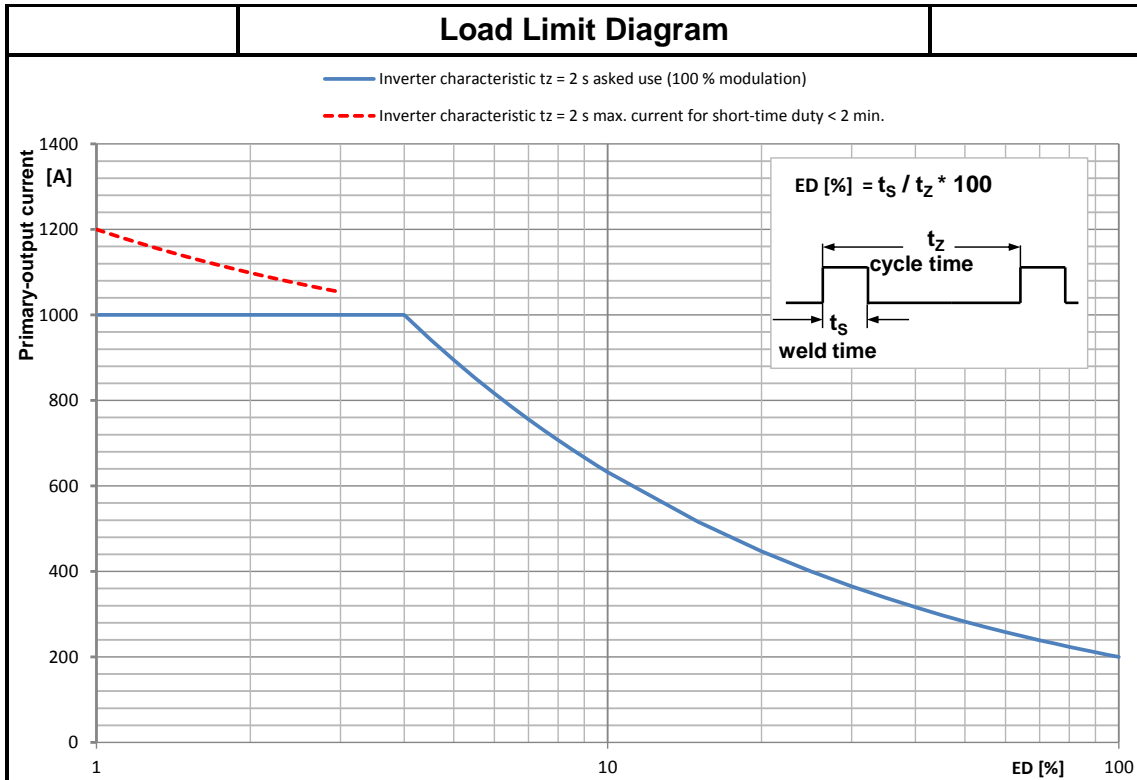
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41183-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann	TITLE	HWI2813W / Genius-, Sinius-, AnalogHWI13W, MFPx13W	SHEETS	1
	STATUS:						

Limit value chart x16L

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI416L	HWI516L
Cooling medium		Air	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	224 kVA	
Primary output current	20 % ED ¹⁾	447 A	
Primary output current	100 % ED ¹⁾	200 A	
Max. primay output current	[10 ms]	1200 A	
Main nominal current (max. thermal continuous current) ³⁾		141 A	
Cooling water requirements			
Cooling water pressure			
Cooling water connection			
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

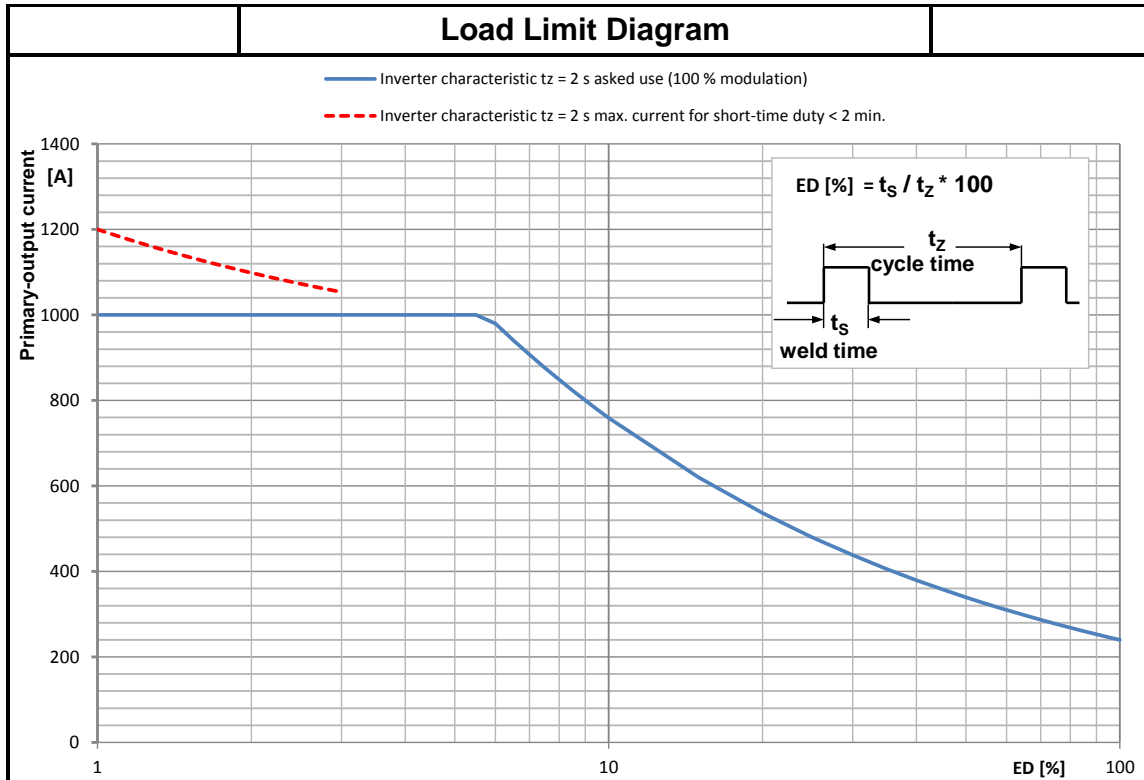
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER 41187-01en	SHEET 1
	DATUM 2017-07-11	2017-07-13		
	NAME Reichardt	Erdmann	TITLE HWI2816L / Genius-, Sinius-, Slave-, AnalogHWIx16L, MFPx16L	SHEETS 1
	STATUS:			

Limit value chart x16W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI416W	HWI516W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	269 kVA	
Primary output current	20 % ED ¹⁾	537 A	
Primary output current	100 % ED ¹⁾	240 A	
Max. primay output current	[10 ms]	1200 A	
Main nominal current (max. thermal continuous current) ³⁾		170 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

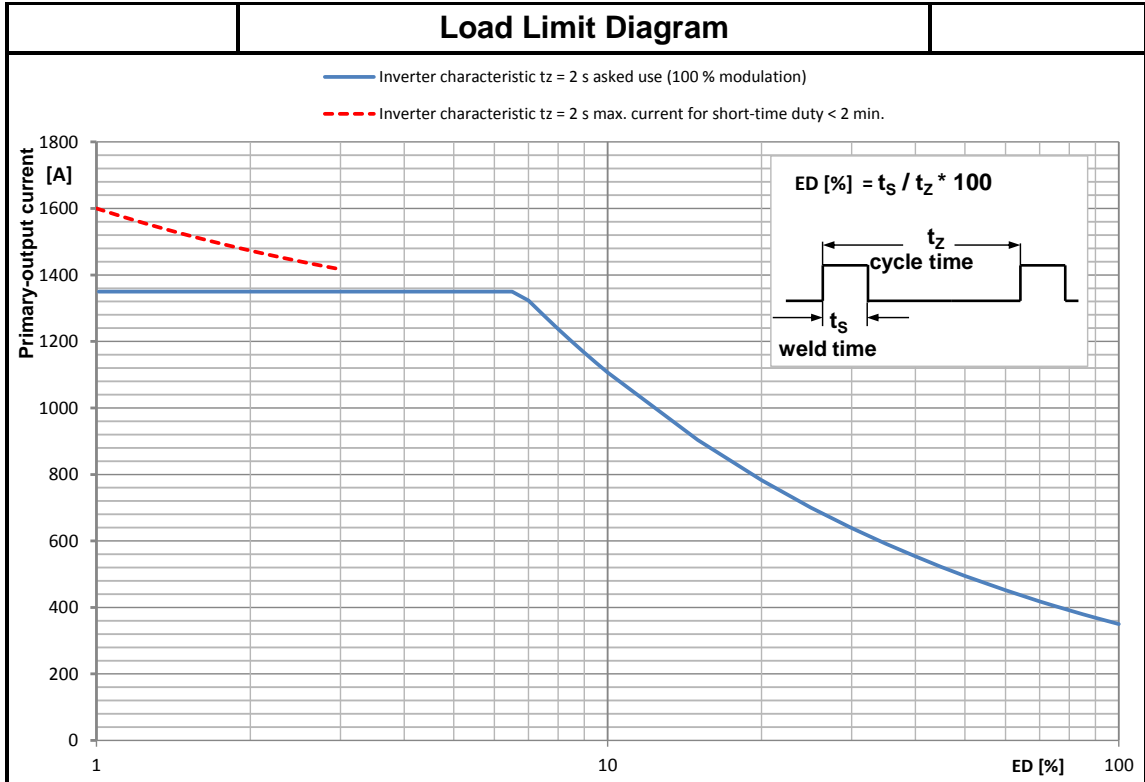
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41188-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann	TITLE	HWI2816W / Genius-, Sinius-, Slave-, AnalogHWI16W, MFPx16W	SHEETS	1
	STATUS:						

Limit value chart x24W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

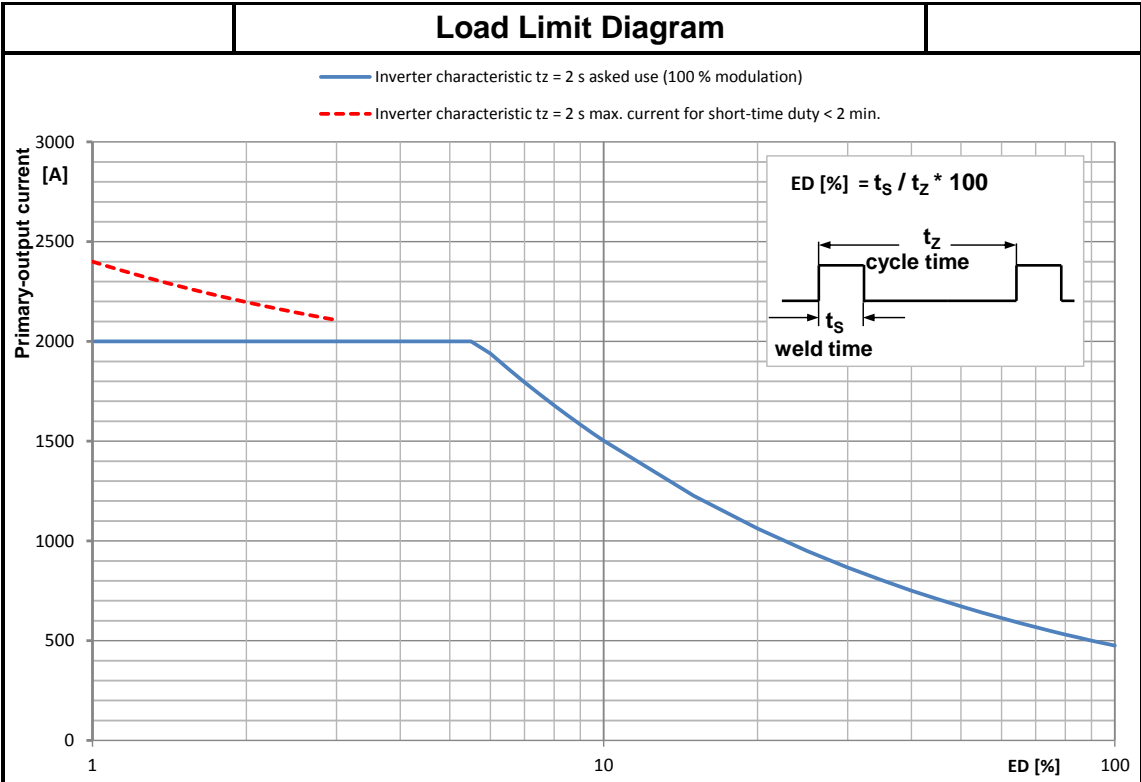
	HWI424W	HWI524W
Designation		
Cooling medium	Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V
Line voltage range	3 ph, -15 % +10 %	480 V
Output voltage	500 / 550 V	
Output voltage		600 V
Rated output	20 % ED ²⁾	392 kVA
Primary output current	20 % ED ¹⁾	783 A
Primary output current	100 % ED ¹⁾	350 A
Max. primay output current	[10 ms]	1600 A
Main nominal current (max. thermal continuous current) ³⁾		247 A
Cooling water requirements	4 l/min	
Cooling water pressure	max. 6 bar	
Cooling water connection	G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature	+10 °C bis max. +45 °C	
Relative humidity	5 % – 85 % No condensation	
Air pressure	86 kPa – 106 kPa	

¹⁾ Peak current is specified.
²⁾ The rated output at 500 V mains voltage is specified.
³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41190-01en	SHEET	1
	DATUM	2017-07-11		2017-07-13		
	NAME	Reichardt	Erdmann			
	STATUS:			TITLE		
				HWI2824W, Genius-, Sinius-, Slave-, AnalogHWIx24W, MFPx24W	SHEETS	1

Limit value chart x36W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

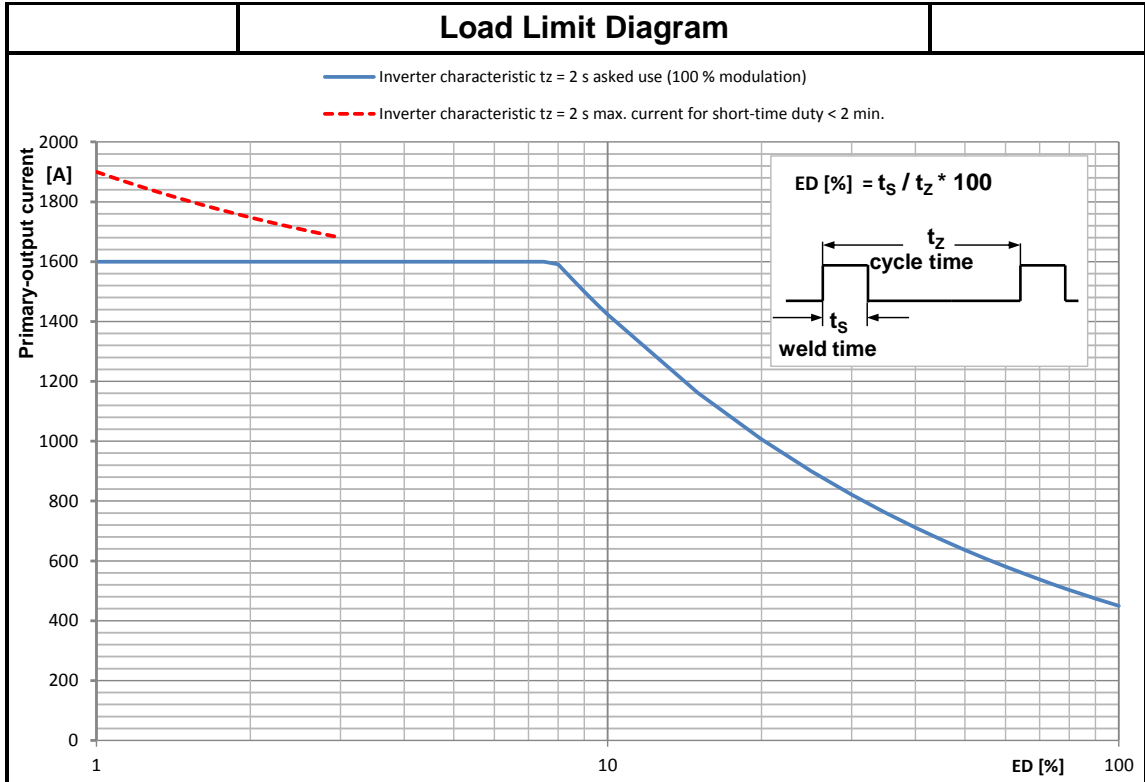
Designation		HWI436W	HWI536W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	531 kVA	
Primary output current	20 % ED ¹⁾	1062 A	
Primary output current	100 % ED ¹⁾	475 A	
Max. primay output current	[10 ms]	2400 A	
Main nominal current (max. thermal continuous current) ³⁾		336 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.
²⁾ The rated output at 500 V mains voltage is specified.
³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41192-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann	TITLE	HWI2836W, Genius-, Sinius-, Slave-, AnalogHWI36W, MFPx36W	SHEETS	1
	STATUS:						

Limit value chart 2x24W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

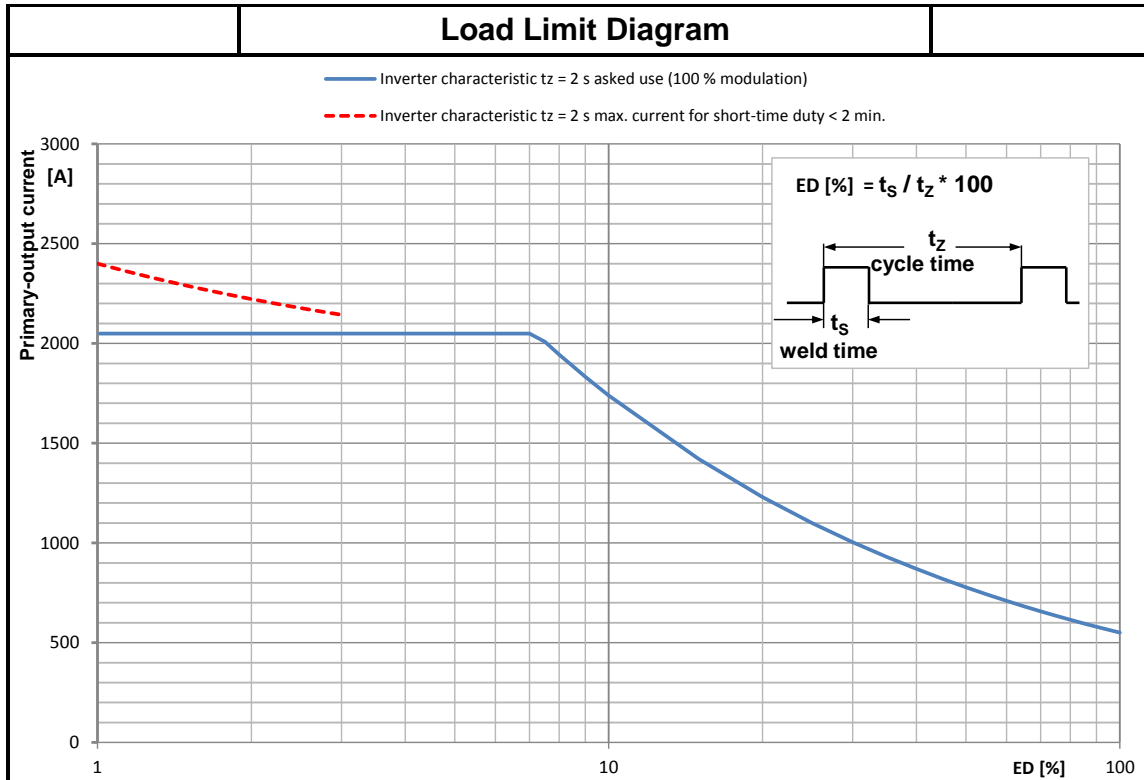
Designation		HWI2424W	HWI2524W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	503 kVA	
Primary output current	20 % ED ¹⁾	1006 A	
Primary output current	100 % ED ¹⁾	450 A	
Max. primay output current	[10 ms]	1900 A	
Main nominal current (max. thermal continuous current) ³⁾		318 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

1) Peak current is specified.
 2) The rated output at 500 V mains voltage is specified.
 3) Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER 41193-01en	SHEET 1
	DATUM 2017-07-11	2017-07-13		
	NAME Reichardt	Erdmann	TITLE HWI2424W, Sinius-, Slave-, AnalogHWI2x24W	SHEETS 1
	STATUS:			

Limit value chart 2x32W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI2432W	HWI2532W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	615 kVA	
Primary output current	20 % ED ¹⁾	1230 A	
Primary output current	100 % ED ¹⁾	550 A	
Max. primay output current	[10 ms]	2400 A	
Main nominal current (max. thermal continuous current) ³⁾		389 A	
Cooling water requirements		4 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

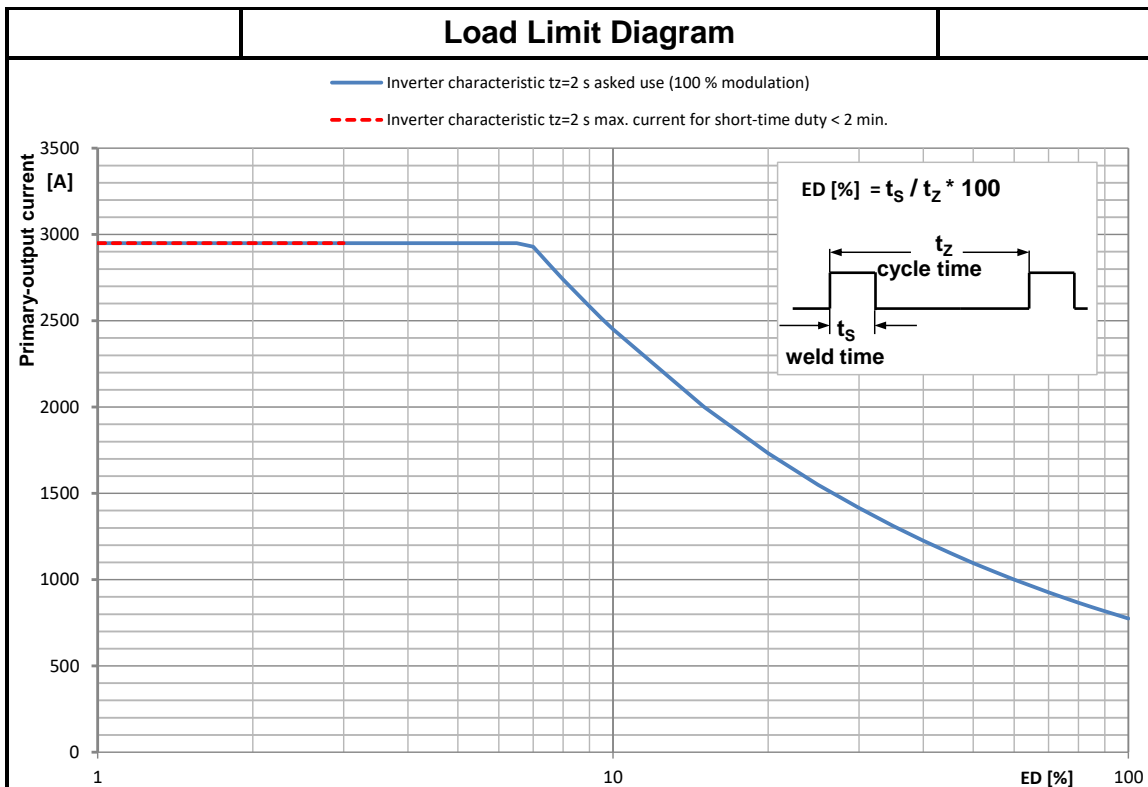
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41194-01en	SHEET	1	
	DATUM	2017-07-11					2017-07-13
	NAME	Reichardt	Erdmann	TITLE	HWI2432W, Sinus-, Slave-, AnalogHWI2x32W	SHEETS	1
	STATUS:						

Limit value chart 3x40W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI3440W	HWI3540W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	867 kVA	
Primary output current	20 % ED ¹⁾	1733 A	
Primary output current	100 % ED ¹⁾	775 A	
Max. primay output current	[10 ms]	2950 A	
Main nominal current (max. thermal continuous current) ³⁾		548 A	
Cooling water requirements		6 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

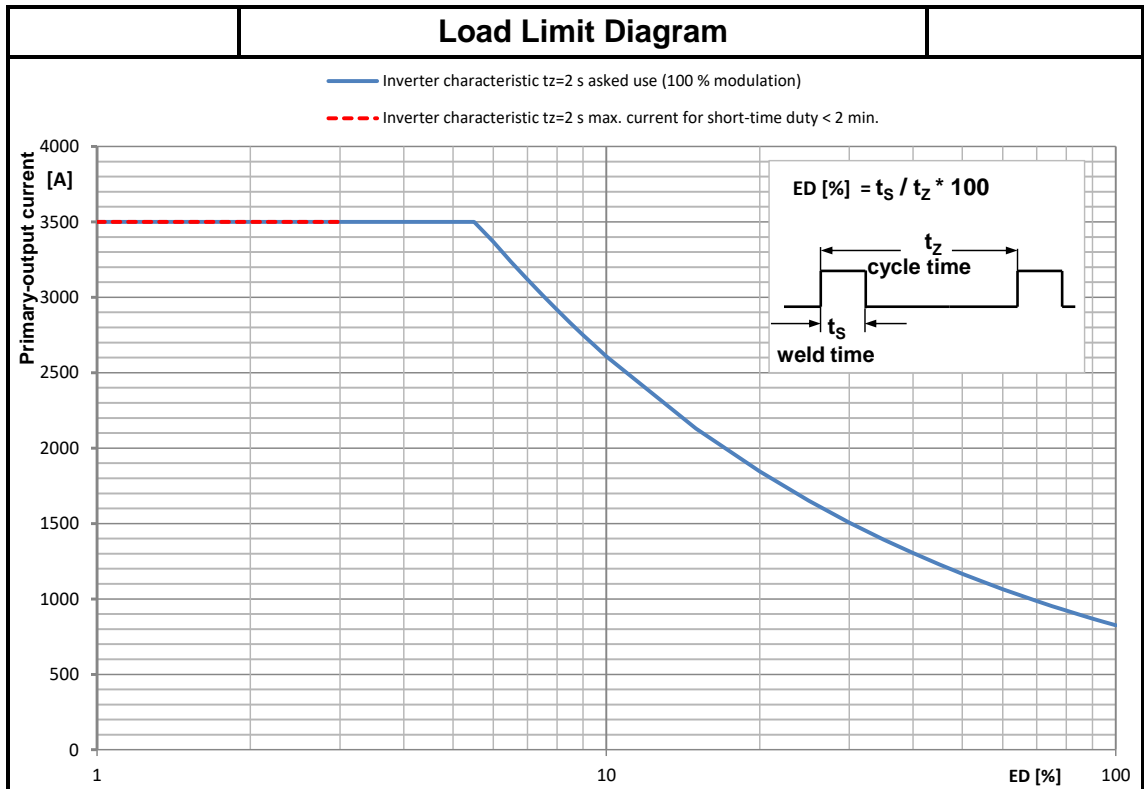
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41195-02en	SHEET	1	
	DATUM	2019-10-23					2019-10-23
	NAME	Reichardt	Hoops	TITLE	HWI2540W, Genius-, Sinius-, Slave-, AnalogHWI3x40W	SHEETS	1
	STATUS:						

Limit value chart 3x45W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI3445W	HWI3545W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %		480 V
Output voltage		500 / 550 V	
Output voltage			600 V
Rated output	20 % ED ²⁾	923 kVA	
Primary output current	20 % ED ¹⁾	1845 A	
Primary output current	100 % ED ¹⁾	825 A	
Max. primay output current	[10 ms]	3500 A	
Main nominal current (max. thermal continuous current) ³⁾		583 A	
Cooling water requirements		6 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

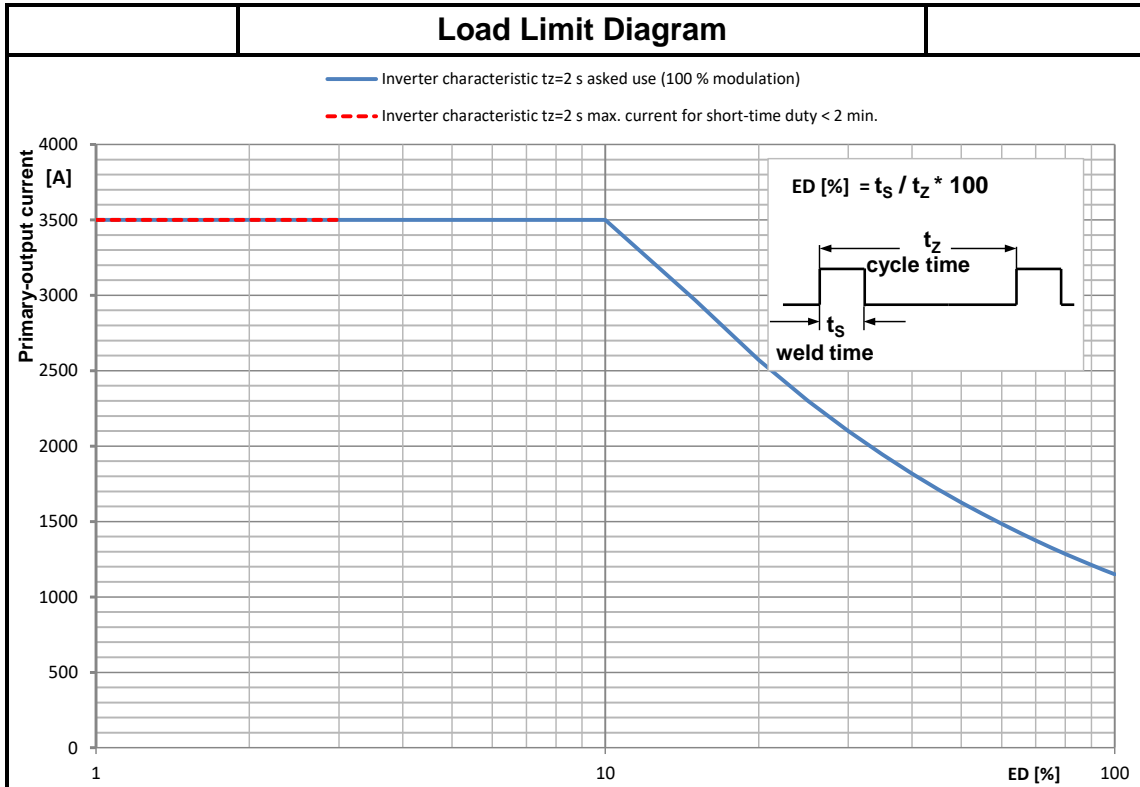
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER	41196-02en	SHEET	1	
	DATUM	2019-10-24					2019-10-24
	NAME	Reichardt	Hoops	TITLE	HWI2545W, Genius-, Sinius-, Slave-, Analog HWI3x45W	SHEETS	1
	STATUS:						

Limit value chart 3x60W

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Load curve represents the absolute limits. For reliable continuous operation, these limits should be exploited with a maximum of 85 %.

Technical data

Designation		HWI3460W	HWI3560W
Cooling medium		Water	
Line voltage range	3 ph, -15 %, +20 %	400 / 440 V	
Line voltage range	3 ph, -15 % +10 %	480 V	
Output voltage		500 / 550 V	
Output voltage		600 V	
Rated output	20 % ED ²⁾	1286 kVA	
Primary output current	20 % ED ¹⁾	2571 A	
Primary output current	100 % ED ¹⁾	1150 A	
Max. primay output current	[10 ms]	3500 A	
Main nominal current (max. thermal continuous current) ³⁾		813 A	
Cooling water requirements		8 l/min	
Cooling water pressure		max. 6 bar	
Cooling water connection		G1/4" nipple with internal cone according to DIN EN 560	
Ambient temperature		+10 °C bis max. +45 °C	
Relative humidity		5 % – 85 % No condensation	
Air pressure		86 kPa – 106 kPa	

¹⁾ Peak current is specified.

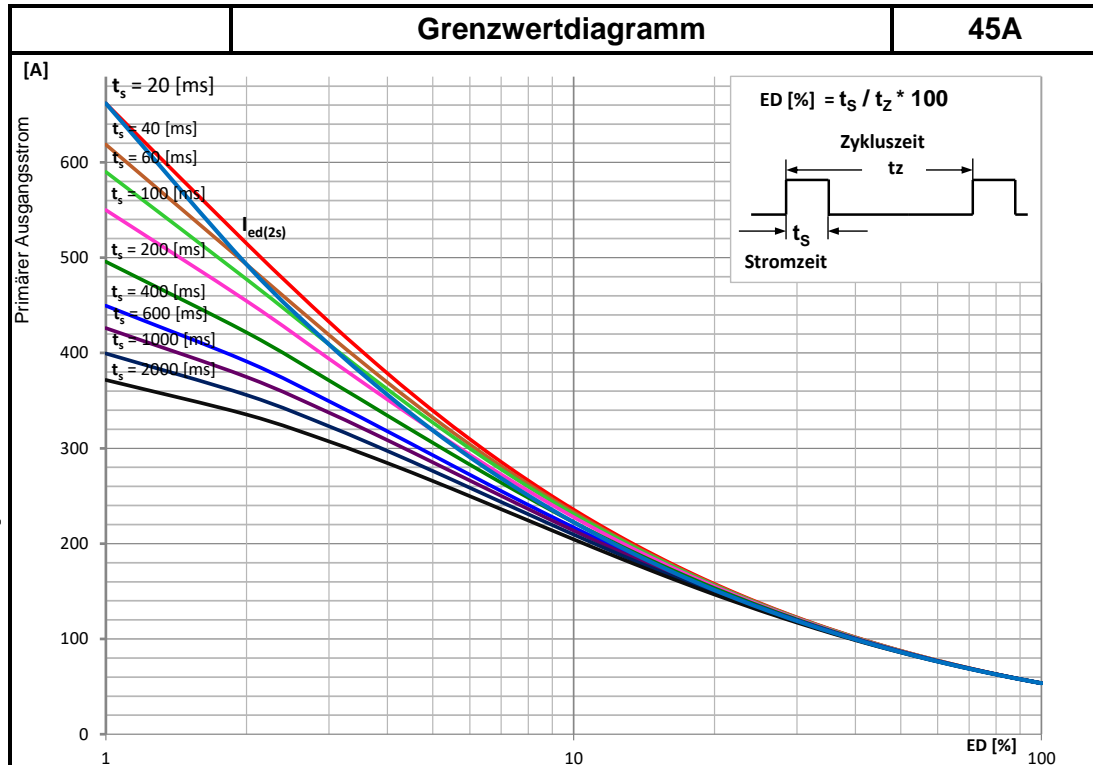
²⁾ The rated output at 500 V mains voltage is specified.

³⁾ Main nominal current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application

	GEZEICHNET	GEPRÜFT	DRAWINGNUMBER 41197-02en	SHEET 1
	DATUM 2019-10-24	2019-10-24		
	NAME Reichardt	Hoops	TITLE HWI2560W, Genius-, Sinius-, Slave-, AnalogHWI3x60W	SHEETS 1
	STATUS:			

Limit value chart LE-L45A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.



Belastungskurve stellt den absoluten Grenzwert dar. Für zuverlässigen Dauerbetrieb sollten diese Grenzwerte mit höchstens 85% ausgenutzt werden.

Technische Daten

Leistungsklasse	LE	45A / 400V	45A / 500V
Kühlmedium		Luft	
Nennspannung	1 ph, -20 %, +10 %	400V	500V
Netzfrequenz	50 / 60 Hz		
Primärer Ausgangsstrom	100 % ED	53,58 A	
Max. primärer Ausgangsstrom	20 ms / 1% ED ¹⁾	661,9 A	
Max. primärer Ausgangsstrom	60 ms / 5% ED ¹⁾	327 A	
Netz-Nennstrom (max. thermischer Dauerstrom)	²⁾	53,58 A	
Kühlwasseranschluss	G1/4" Nippel mit Innenkegel nach DIN EN 560		
Kühlwasserbedarf			
Kühlwasserdruck	max. 6 bar		
Kühlwassertemperatur	+25 °C		
Umgebungstemperatur	+45 °C		
Relative Luftfeuchtigkeit	5 % – 85 % keine Betauung		
Luftdruck	86 kPa – 106 kPa		

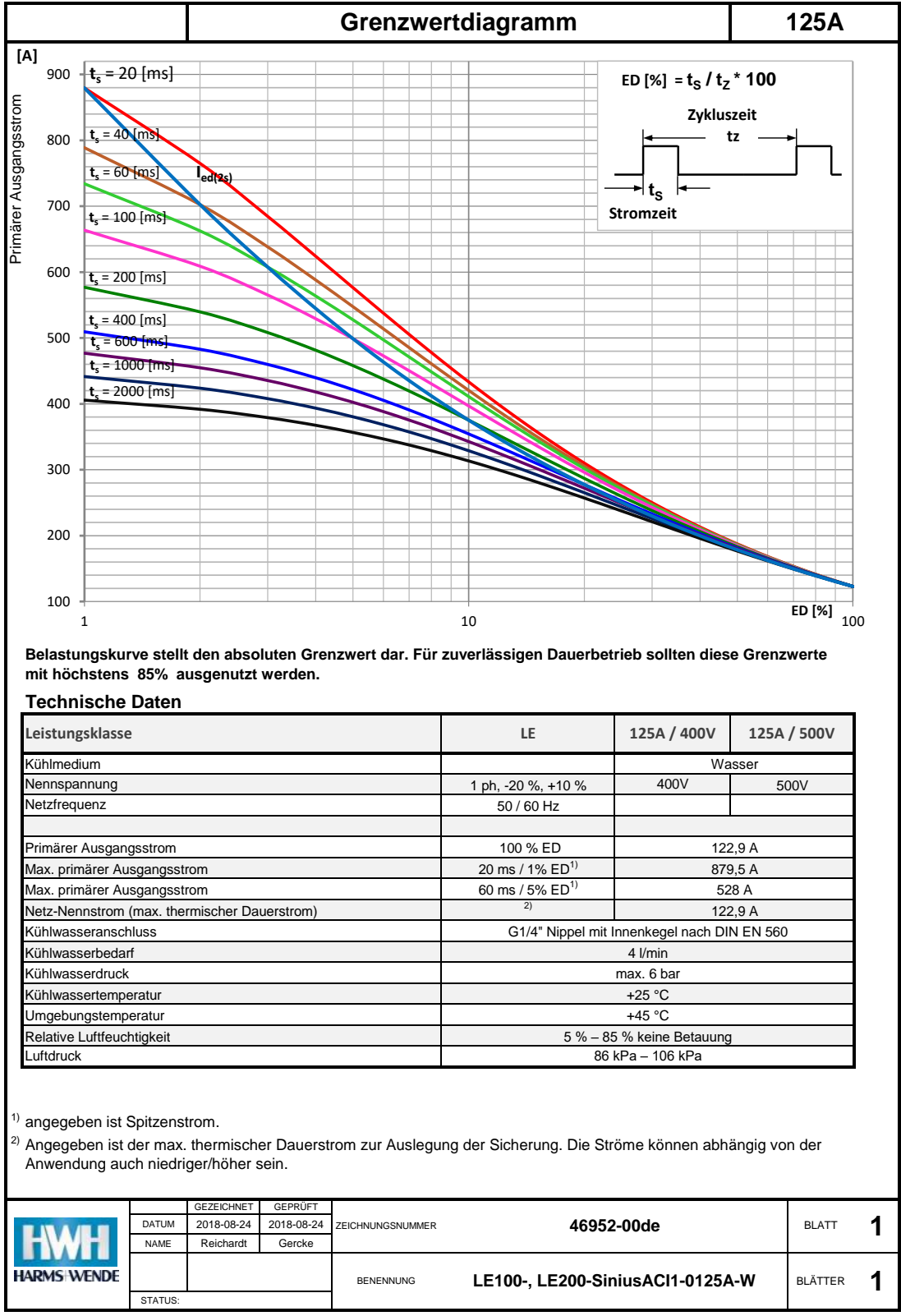
¹⁾ angegeben ist Spitzenstrom.

²⁾ Angegeben ist der max. thermischer Dauerstrom zur Auslegung der Sicherung. Die Ströme können abhängig von der Anwendung auch niedriger/höher sein.

	GEZEICHNET	GEPRÜFT	ZEICHNUNGSNUMMER	46951-00de	BLATT	1
	DATUM	2019-02-15				
	NAME	Reichardt	Gercke	BENENNUNG	BLÄTTER	1
	STATUS:					

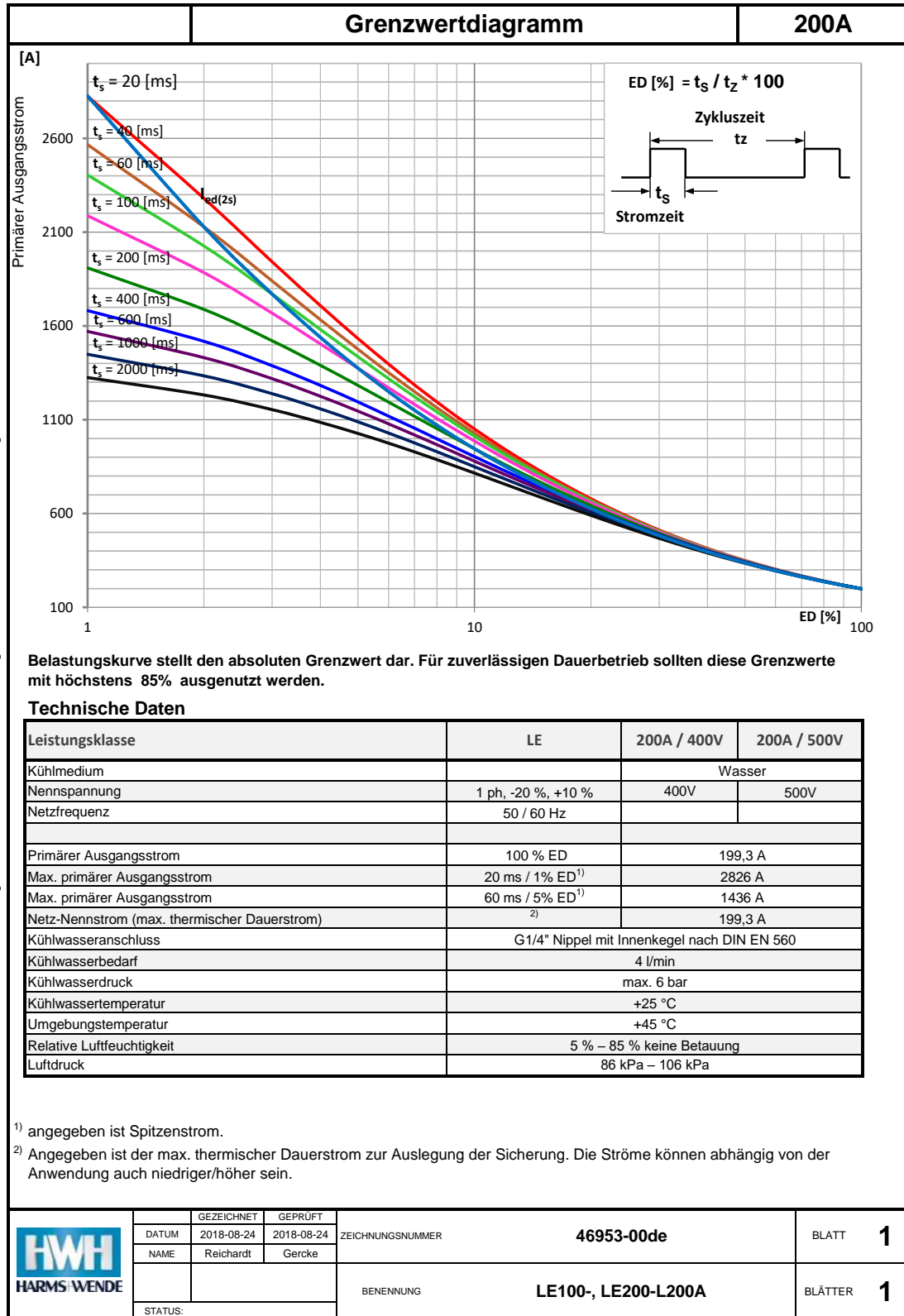
Limit value chart LE-125A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.



Limit value chart LE-L200A

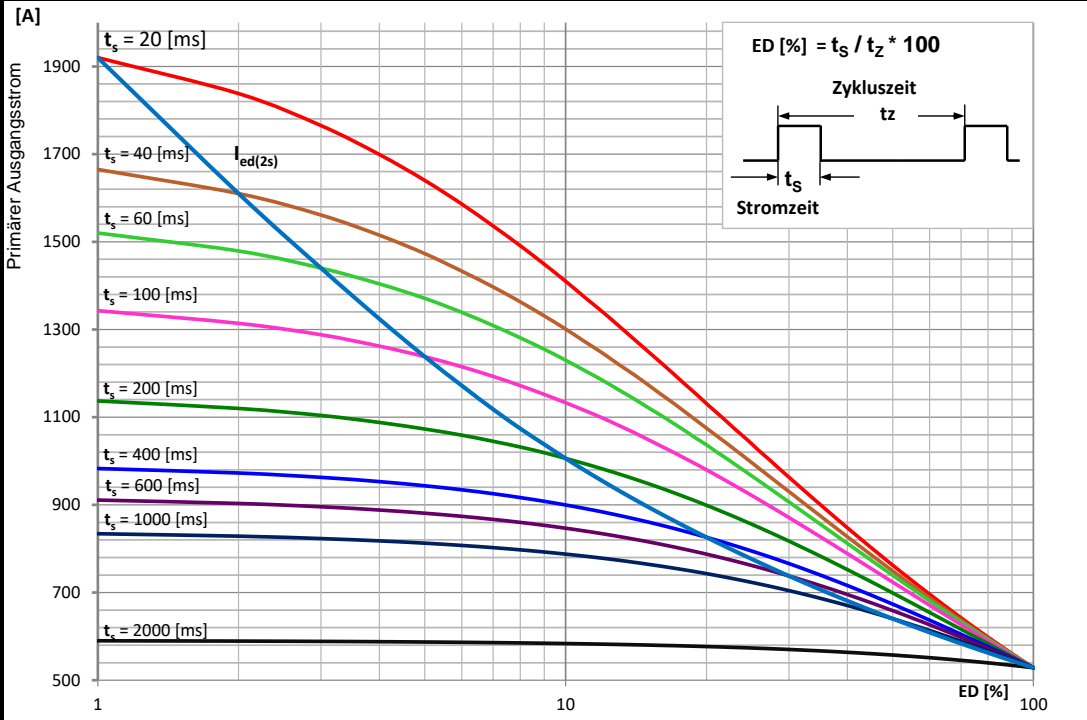
Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.



Limit value chart LE-580A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.

Grenzwertdiagramm 580A



Belastungskurve stellt den absoluten Grenzwert dar. Für zuverlässigen Dauerbetrieb sollten diese Grenzwerte mit höchstens 85% ausgenutzt werden.

Technische Daten

Leistungsklasse	LE	580A / 400V	580A / 500V
Kühlmedium	Wasser		
Nennspannung	1 ph, -20 %, +10 %	400V	500V
Netzfrequenz	50 / 60 Hz		
Primärer Ausgangsstrom	100 % ED	528,6 A	
Max. primärer Ausgangsstrom	20 ms / 1% ED ¹⁾	1920 A	
Max. primärer Ausgangsstrom	60 ms / 5% ED ¹⁾	1371 A	
Netz-Nennstrom (max. thermischer Dauerstrom)	2)		528,6 A
Kühlwasseranschluss	G1/4" Nippel mit Innenkegel nach DIN EN 560		
Kühlwasserbedarf	4 l/min		
Kühlwasserdruck	max. 6 bar		
Kühlwassertemperatur	+25 °C		
Umgebungstemperatur	+45 °C		
Relative Luftfeuchtigkeit	5 % – 85 % keine Betauung		
Luftdruck	86 kPa – 106 kPa		

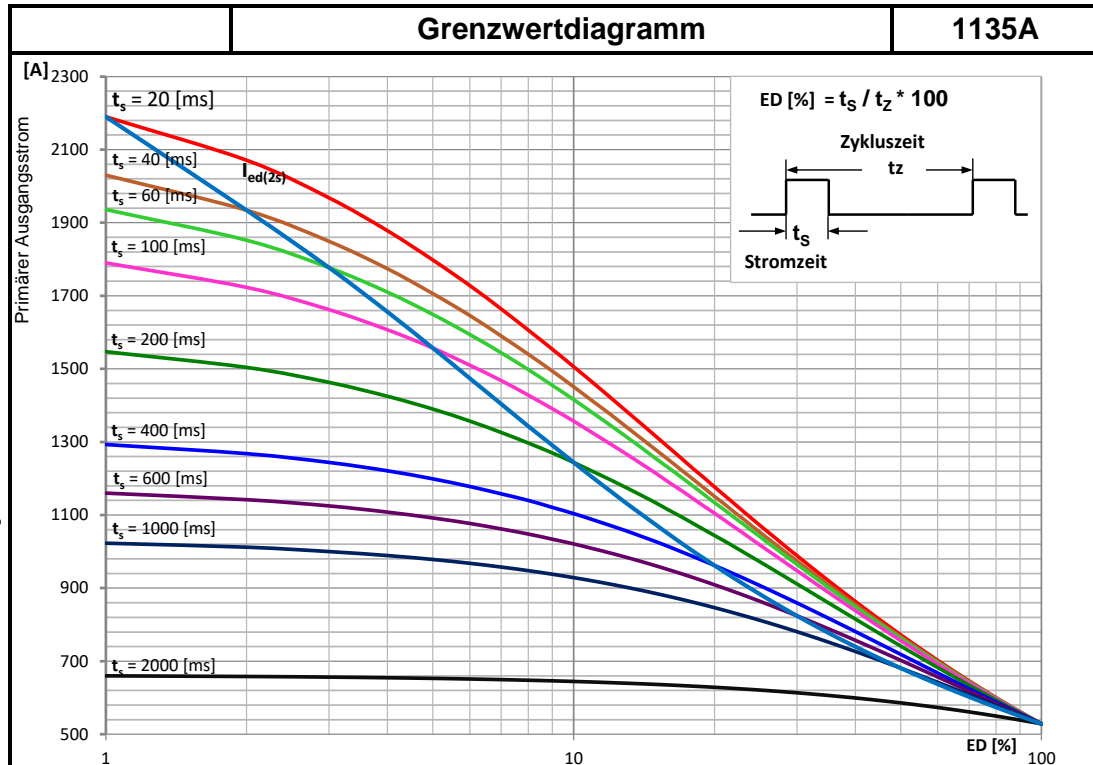
¹⁾ angegeben ist Spitzenstrom.

²⁾ Angegeben ist der max. thermischer Dauerstrom zur Auslegung der Sicherung. Die Ströme können abhängig von der Anwendung auch niedriger/höher sein.

	GEZEICHNET	GEPRÜFT	ZEICHNUNGSNUMMER 46954-00de	BLATT 1
	DATUM 2019-02-14	2019-02-14		
	NAME Reichardt	Erdmann	BENENNUNG LE100-, LE200-, LE28-580A	BLÄTTER 1
	STATUS:			

Limit value chart LE-1135A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.



Belastungskurve stellt den absoluten Grenzwert dar. Für zuverlässigen Dauerbetrieb sollten diese Grenzwerte mit höchstens 85% ausgenutzt werden.

Technische Daten

Leistungsklasse	LE	1135A / 400V	1135A / 500V
Kühlmedium	Wasser		
Nennspannung	1 ph, -20 %, +10 %	400V	500V
Netzfrequenz	50 / 60 Hz		
Primärer Ausgangsstrom	100 % ED	528,6 A	
Max. primärer Ausgangsstrom	20 ms / 1% ED ¹⁾	2190 A	
Max. primärer Ausgangsstrom	60 ms / 5% ED ¹⁾	1649 A	
Netz-Nennstrom (max. thermischer Dauerstrom)	2)		528,6 A
Kühlwasseranschluss	G1/4" Nippel mit Innenkegel nach DIN EN 560		
Kühlwasserbedarf	4 l/min		
Kühlwasserdruck	max. 6 bar		
Kühlwassertemperatur	+25 °C		
Umgebungstemperatur	+45 °C		
Relative Luftfeuchtigkeit	5 % – 85 % keine Betauung		
Luftdruck	86 kPa – 106 kPa		

¹⁾ angegeben ist Spitzenstrom.

²⁾ Angegeben ist der max. thermischer Dauerstrom zur Auslegung der Sicherung. Die Ströme können abhängig von der Anwendung auch niedriger/höher sein.

	GEZEICHNET	GEPRÜFT	ZEICHNUNGSNUMMER	46955-00de	BLATT	1
	DATUM	2018-08-24				
	NAME	Reichardt	Gercke	BENENNUNG	BLÄTTER	1
	STATUS:					

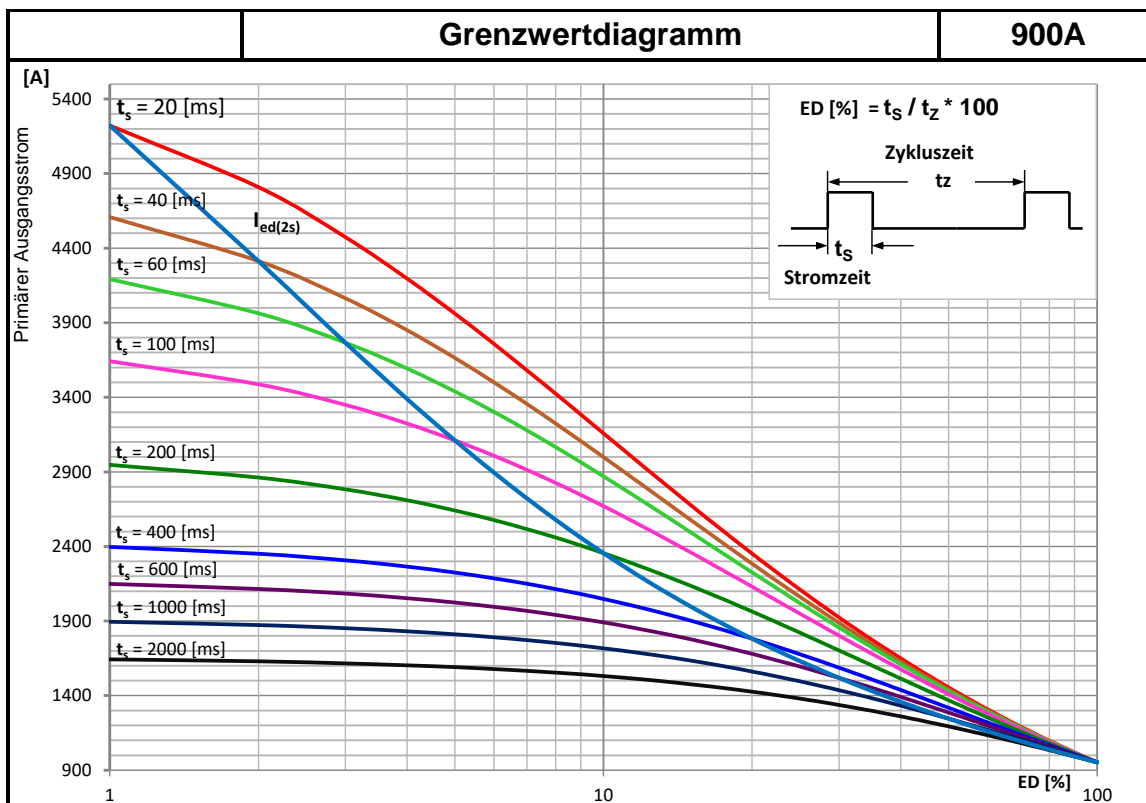
Limit value chart LE-700A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.

	Grenzwertdiagramm	700A																																																												
<p>[A]</p> <p>Primärer Ausgangsstrom</p>																																																														
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<p>Technische Daten</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Leistungsklasse</th> <th>LE</th> <th>700A / 400V</th> <th>700A / 500V</th> </tr> </thead> <tbody> <tr> <td>Kühlmedium</td> <td></td> <td colspan="2" style="text-align: center;">Wasser</td> </tr> <tr> <td>Nennspannung</td> <td>1 ph, -20 %, +10 %</td> <td>400V</td> <td>500V</td> </tr> <tr> <td>Netzfrequenz</td> <td>50 / 60 Hz</td> <td></td> <td></td> </tr> <tr> <td>Primärer Ausgangsstrom</td> <td>100 % ED</td> <td colspan="2" style="text-align: center;">748,6 A</td> </tr> <tr> <td>Max. primärer Ausgangsstrom</td> <td>20 ms / 1% ED¹⁾</td> <td colspan="2" style="text-align: center;">4400 A</td> </tr> <tr> <td>Max. primärer Ausgangsstrom</td> <td>60 ms / 5% ED¹⁾</td> <td colspan="2" style="text-align: center;">2841 A</td> </tr> <tr> <td>Netz-Nennstrom (max. thermischer Dauerstrom)</td> <td>²⁾</td> <td colspan="2" style="text-align: center;">748,6 A</td> </tr> <tr> <td>Kühlwasseranschluss</td> <td colspan="3" style="text-align: center;">G1/4" Nippel mit Innenkegel nach DIN EN 560</td> </tr> <tr> <td>Kühlwasserbedarf</td> <td colspan="3" style="text-align: center;">4 l/min</td> </tr> <tr> <td>Kühlwasserdruck</td> <td colspan="3" style="text-align: center;">max. 6 bar</td> </tr> <tr> <td>Kühlwassertemperatur</td> <td colspan="3" style="text-align: center;">+25 °C</td> </tr> <tr> <td>Umgebungstemperatur</td> <td colspan="3" style="text-align: center;">+45 °C</td> </tr> <tr> <td>Relative Luftfeuchtigkeit</td> <td colspan="3" style="text-align: center;">5 % – 85 % keine Betauung</td> </tr> <tr> <td>Luftdruck</td> <td colspan="3" style="text-align: center;">86 kPa – 106 kPa</td> </tr> </tbody> </table>			Leistungsklasse	LE	700A / 400V	700A / 500V	Kühlmedium		Wasser		Nennspannung	1 ph, -20 %, +10 %	400V	500V	Netzfrequenz	50 / 60 Hz			Primärer Ausgangsstrom	100 % ED	748,6 A		Max. primärer Ausgangsstrom	20 ms / 1% ED ¹⁾	4400 A		Max. primärer Ausgangsstrom	60 ms / 5% ED ¹⁾	2841 A		Netz-Nennstrom (max. thermischer Dauerstrom)	²⁾	748,6 A		Kühlwasseranschluss	G1/4" Nippel mit Innenkegel nach DIN EN 560			Kühlwasserbedarf	4 l/min			Kühlwasserdruck	max. 6 bar			Kühlwassertemperatur	+25 °C			Umgebungstemperatur	+45 °C			Relative Luftfeuchtigkeit	5 % – 85 % keine Betauung			Luftdruck	86 kPa – 106 kPa		
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<p>¹⁾ angegeben ist Spitzenstrom.</p> <p>²⁾ Angegeben ist der max. thermischer Dauerstrom zur Auslegung der Sicherung. Die Ströme können abhängig von der Anwendung auch niedriger/höher sein.</p>																																																														
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%;">GEZEICHNET</td> <td style="width: 15%;">GEPRÜFT</td> <td style="width: 55%;"></td> </tr> <tr> <td>DATUM</td> <td>2018-08-24</td> <td>2018-08-24</td> <td>ZEICHNUNGSNUMMER</td> </tr> <tr> <td>NAME</td> <td>Reichardt</td> <td>Gercke</td> <td style="text-align: center;">46909-00de</td> </tr> <tr> <td>STATUS:</td> <td></td> <td></td> <td></td> </tr> </table>		GEZEICHNET	GEPRÜFT		DATUM	2018-08-24	2018-08-24	ZEICHNUNGSNUMMER	NAME	Reichardt	Gercke	46909-00de	STATUS:				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;"></td> <td style="width: 40%; text-align: center;">BLATT 1</td> </tr> <tr> <td style="text-align: center;">BENENNUNG</td> <td style="text-align: center;"> LE6-, LE7-, LE10-, LE11, LE19-, LE20-, LE5000-0700A </td> </tr> <tr> <td></td> <td style="text-align: center;">BLÄTTER 1</td> </tr> </table>		BLATT 1	BENENNUNG	LE6-, LE7-, LE10-, LE11, LE19-, LE20-, LE5000-0700A		BLÄTTER 1																																						
	GEZEICHNET	GEPRÜFT																																																												
DATUM	2018-08-24	2018-08-24	ZEICHNUNGSNUMMER																																																											
NAME	Reichardt	Gercke	46909-00de																																																											
STATUS:																																																														
	BLATT 1																																																													
BENENNUNG	LE6-, LE7-, LE10-, LE11, LE19-, LE20-, LE5000-0700A																																																													
	BLÄTTER 1																																																													

Limit value chart LE-900A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.



Belastungskurve stellt den absoluten Grenzwert dar. Für zuverlässigen Dauerbetrieb sollten diese Grenzwerte mit höchstens 85% ausgenutzt werden.

Technische Daten

Leistungsklasse	LE	900A / 400V	900A / 500V
Kühlmedium		Wasser	
Nennspannung	1 ph, -20 %, +10 %	400V	500V
Netzfrequenz	50 / 60 Hz		
Primärer Ausgangsstrom	100 % ED	952,8 A	
Max. primärer Ausgangsstrom	20 ms / 1% ED ¹⁾	5222 A	
Max. primärer Ausgangsstrom	60 ms / 5% ED ¹⁾	3439 A	
Netz-Nennstrom (max. thermischer Dauerstrom)	²⁾	952,8 A	
Kühlwasseranschluss	G1/4" Nippel mit Innenkegel nach DIN EN 560		
Kühlwasserbedarf	4 l/min		
Kühlwasserdruck	max. 6 bar		
Kühlwassertemperatur	+25 °C		
Umgebungstemperatur	+45 °C		
Relative Luftfeuchtigkeit	5 % – 85 % keine Betauung		
Luftdruck	86 kPa – 106 kPa		

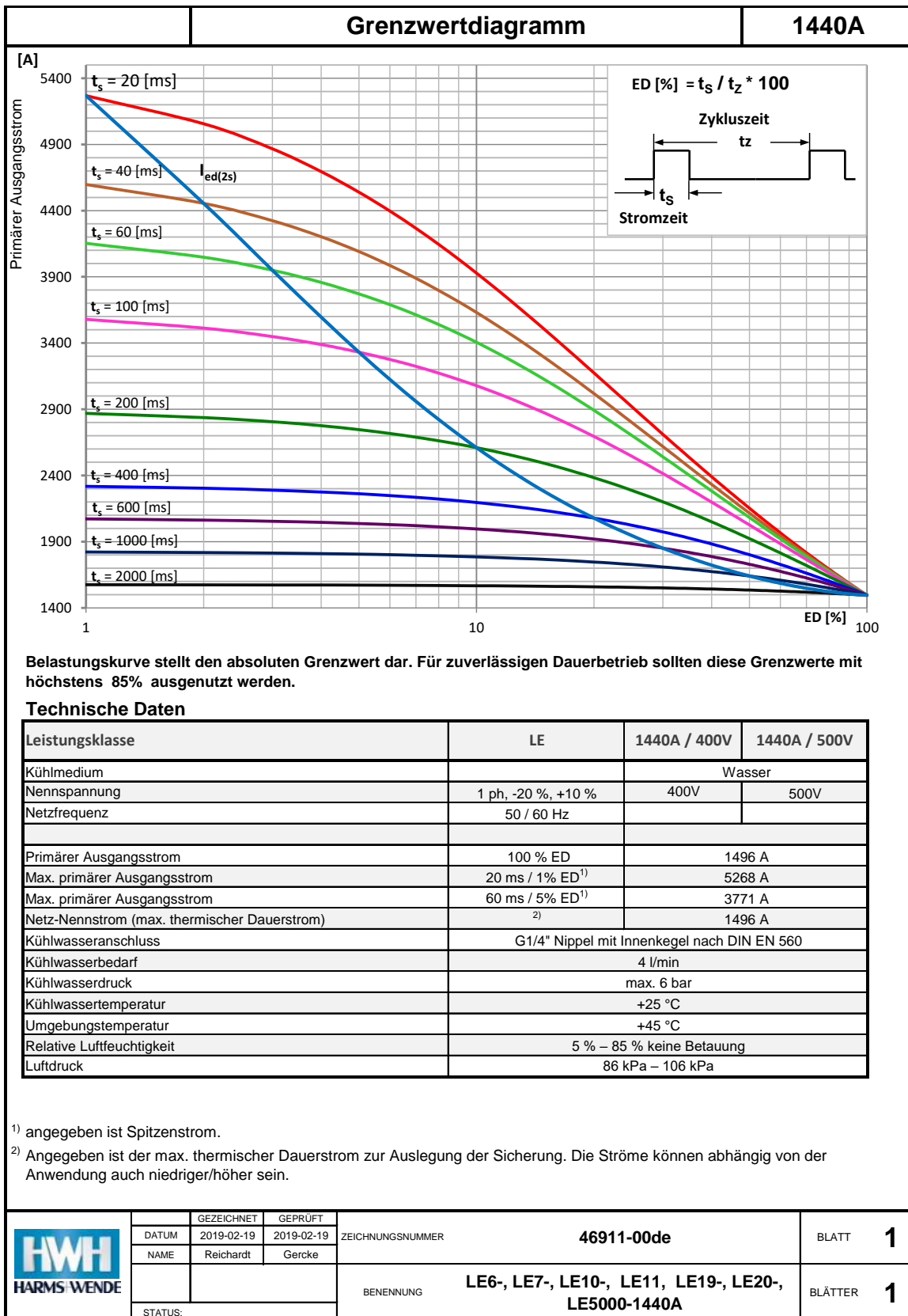
¹⁾ angegeben ist Spitzenstrom.

²⁾ Angegeben ist der max. thermischer Dauerstrom zur Auslegung der Sicherung. Die Ströme können abhängig von der Anwendung auch niedriger/höher sein.

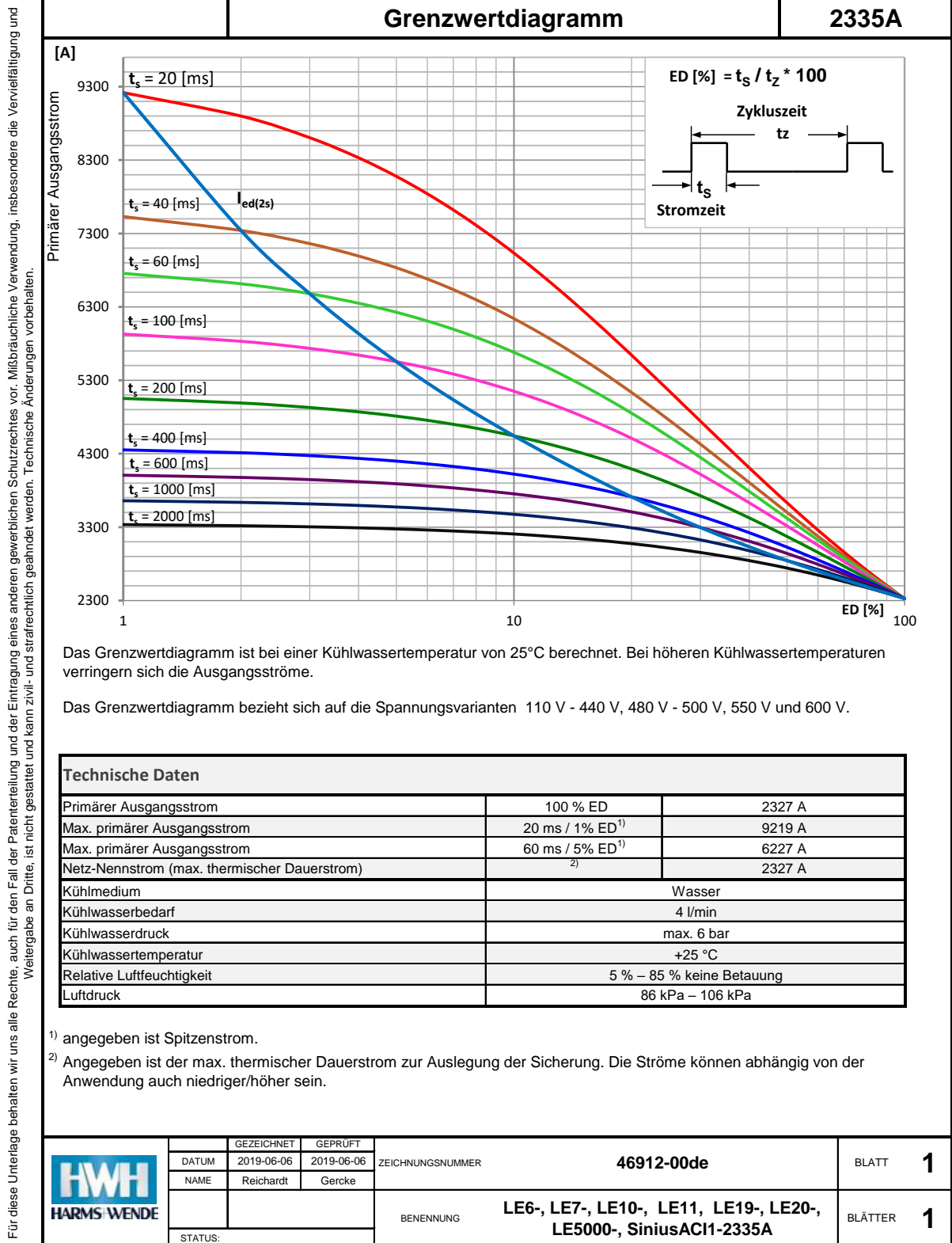
	GEZEICHNET	GEPRÜFT	ZEICHNUNGSNUMMER	46909-00de	BLATT	1	
	DATUM	2018-08-24					2018-08-24
	NAME	Reichardt					Gercke
STATUS:			BENENNUNG	LE6-, LE7-, LE10-, LE11, LE19-, LE20-, LE5000-0700A	BLÄTTER	1	

Limit value chart LE-1440A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mitbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.

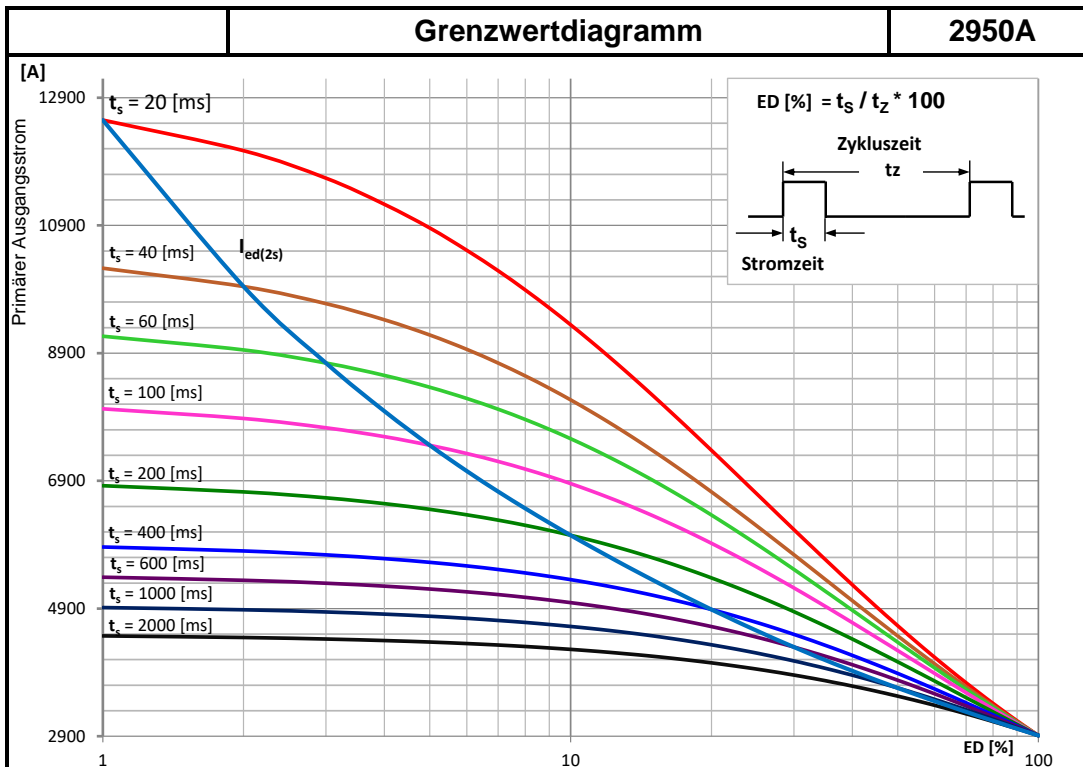


Limit value chart LE-2335A



Limit value chart LE-2950A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.



Belastungskurve stellt den absoluten Grenzwert dar. Für zuverlässigen Dauerbetrieb sollten diese Grenzwerte mit höchstens 85% ausgenutzt werden.

Technische Daten

Leistungsklasse	LE	2950A / 400V	2950A / 500V
Kühlmedium		Wasser	
Nennspannung	1 ph, -20 %, +10 %	400V	500V
Netzfrequenz	50 / 60 Hz		
Primärer Ausgangsstrom	100 % ED	2912 A	
Max. primärer Ausgangsstrom	20 ms / 1% ED ¹⁾	12550 A	
Max. primärer Ausgangsstrom	60 ms / 5% ED ¹⁾	8366 A	
Netz-Nennstrom (max. thermischer Dauerstrom)	²⁾	2912 A	
Kühlwasseranschluss	G1/4" Nippel mit Innenkegel nach DIN EN 560		
Kühlwasserbedarf	4 l/min		
Kühlwasserdruck	max. 6 bar		
Kühlwassertemperatur	+25 °C		
Umgebungstemperatur	+45 °C		
Relative Luftfeuchtigkeit	5 % – 85 % keine Betauung		
Luftdruck	86 kPa – 106 kPa		

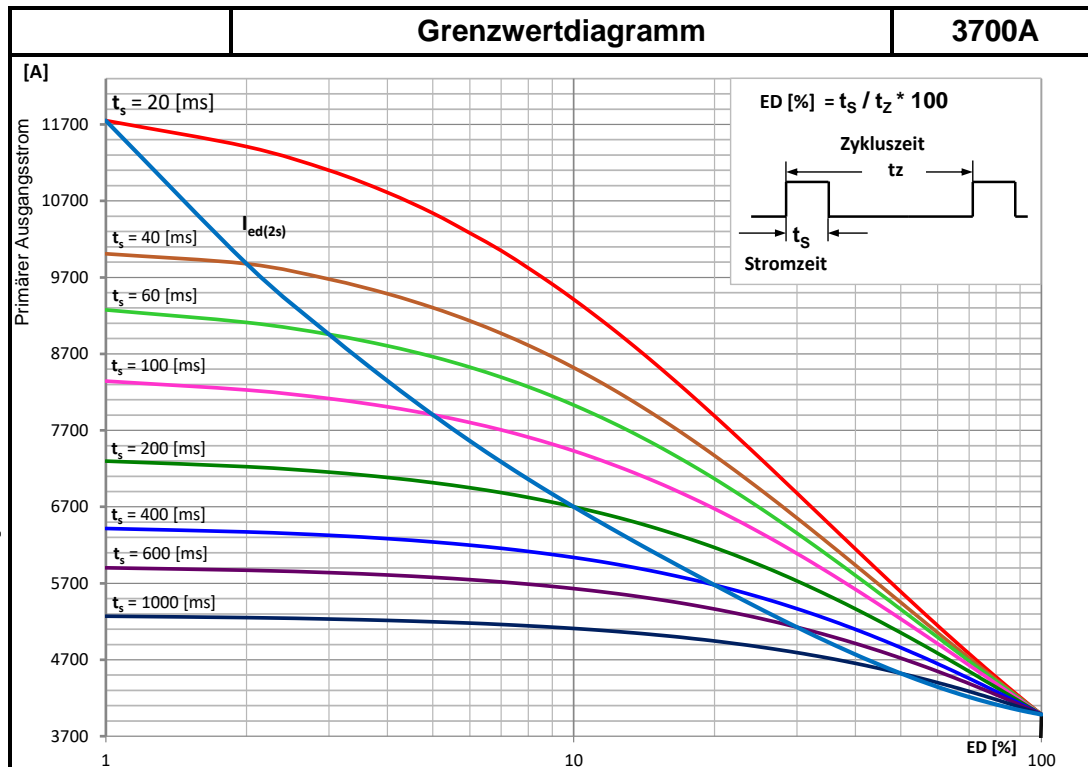
¹⁾ angegeben ist Spitzenstrom.

²⁾ Angegeben ist der max. thermischer Dauerstrom zur Auslegung der Sicherung. Die Ströme können abhängig von der Anwendung auch niedriger/höher sein.

	GEZEICHNET	GEPRÜFT	ZEICHNUNGSNUMMER	46913-00de	BLATT	1	
	DATUM	2019-02-19					2019-02-19
	NAME	Reichardt	Gercke	BENENNUNG	LE6-, LE7-, LE10-, LE11, LE19-, LE20-, LE5000-, SinusACI1-2950A	BLÄTTER	1
	STATUS:						

Limit value chart LE-3700A

Für diese Unterlage behalten wir uns alle Rechte, auch für den Fall der Patenterteilung und der Eintragung eines anderen gewerblichen Schutzrechtes vor. Mißbräuchliche Verwendung, insbesondere die Vervielfältigung und Weitergabe an Dritte, ist nicht gestattet und kann zivil- und strafrechtlich geahndet werden. Technische Änderungen vorbehalten.



Belastungskurve stellt den absoluten Grenzwert dar. Für zuverlässigen Dauerbetrieb sollten diese Grenzwerte mit höchstens 85% ausgenutzt werden.

Technische Daten

Leistungsklasse	LE	3700A / 400V	3700A / 500V
Kühlmedium		Wasser	
Nennspannung	1 ph, -20 %, +10 %	400V	500V
Netzfrequenz	50 / 60 Hz		
Primärer Ausgangsstrom	100 % ED	3700 A	
Max. primärer Ausgangsstrom	20 ms / 1% ED ¹⁾	11750 A	
Max. primärer Ausgangsstrom	60 ms / 5% ED ¹⁾	8663 A	
Netz-Nennstrom (max. thermischer Dauerstrom)	²⁾	3700 A	
Kühlwasseranschluss	G1/4" Nippel mit Innenkegel nach DIN EN 560		
Kühlwasserbedarf	4 l/min		
Kühlwasserdruck	max. 6 bar		
Kühlwassertemperatur	+25 °C		
Umgebungstemperatur	+45 °C		
Relative Luftfeuchtigkeit	5 % – 85 % keine Betauung		
Luftdruck	86 kPa – 106 kPa		

¹⁾ angegeben ist Spitzenstrom.

²⁾ Angegeben ist der max. thermischer Dauerstrom zur Auslegung der Sicherung. Die Ströme können abhängig von der Anwendung auch niedriger/höher sein.

	GEZEICHNET	GEPRÜFT	ZEICHNUNGSNUMMER	46914-00de	BLATT	1
	DATUM	2019-02-19				
	NAME	Reichardt	Gercke	BENENNUNG	BLÄTTER	1
	STATUS:					

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