



# HARMS+WENDE



## Product Catalogue 2017



## Industrial Solutions

Version 2017-04-07



## **Imprint**

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### *Introduction*

For over seven decades, we have 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.





## Overview of uses

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

### Modular welding control system network / individual workstation with PC-based visualisation

GeniusHWI	Ratia73		
MF	AC		
			

### Welding control system – individual workstation with integrated control 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	
			



## Overview of medium-frequency systems

Basic information on the medium-frequency systems

Function scope	GeniusHWI	FiliusMFS + MFP	SiniusHWI
Images			
Uses	Suppliers, mechanical engineering, series production manufacturers, special systems		
Operating concepts	Control systems with networked operating software	Parameterisation in the control system (stand-alone)	Operation via PLC
Programs	256-512	8-128, 2x16	internal 8
Welding profile	VWZ, SZ, NWZ	VWZ, SZ, NWZ	Flexible
Control	KSR, IQR	KSR	KSR
Monitoring	Limit value monitoring, envelope, displacement monitoring, travel measurement	Limit value monitoring, travel measurement	Via PLC, externally with PQS
Analysis functions	Current, voltage, resistance curve		Via PLC
Machine connection	24 V I/O, various bus systems	24 V I/O	24 V I/O, various bus systems
Electrode management	Pre-warning, electrode wear, stepper function, milling function	Pre-warning, electrode wear, stepper function	Via PLC
Valves	1 proportional valve, 1 solenoid valve	2 proportional valves, 2 solenoid valves, 1 pre-stroke valve	Via PLC
Mains voltage	400 - 440 V, 480 V		
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

Function scope	Sinius	MPS10	FiliusAC	Ratio43	Ratio73
Images					
Programs	8 internal	8	8, 32, 128	128	128
Number of start inputs	1	2	1, 2	2	2
Number of ignition outputs	1, 3	1	1	1, 3	1, 3
Mains frequency	50 Hz / 60 Hz automatically, with mains voltage compensation				
Operation	With PLC	Integrated	Integrated	Integrated	XPegasus
Current regulation	1-phase	No	1-phase	1- and 3-phase	
Current monitoring	With PLC	No	Yes	1- and 3-phase	
Regulation range limit	No	No	Yes	Yes	Yes
Current profiles	80	1	3	3, [10 optional]	
Solenoid valves	No	2	1, 2	2	
Proportional valve outputs	Yes	No	1, 2	1	
Pressure program	No	No	Yes	Yes	
Time setting	Per., half wave	Per., half wave	Per., half wave, ms	Per., half wave	
Spot counter / counter groups	No	No	1, 2	128	
Stepper function	No	No	Yes	Yes	
Data communication	No	No	No	RS422	RS422, Ethernet
Bus communication	Yes	No	No	24 V I/O	PBS, IBSe, IBSo
Operating modes	Single spot, serial spot				
Seam operating mode	Yes	No	Yes	Yes	Yes
Data backup	No	No	Via USB	With XPegasus	



## Genius product series



Fig. 2-1 *GeniusHVI* inverters



Fig. 2-2 *GeniusHWI3xy* inverters

### Description

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

The CPU and welding process card forms the basis of the Genius inverter system. Further hardware plug-in modules such as e.g. fieldbus cards or I/O cards make this device highly adaptable. The various IQR, PQS and process management software packages also enable this system to be extended very flexibly. Even the system's basic equipment includes visualisation of the last ten resistance, current and voltage curves.

### Operating concepts

Central operation of up to 20 control systems with the **X**Pegasus operating software via Ethernet (not included in the delivery scope).

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

### Machine and robot connection

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

## GeniusHWI



Fig. 2-3 *GeniusHWI* inverters

## Description

The *GeniusHWI* series inverters consist of a medium-frequency power unit with an integrated modular control system. Maximum flexibility is achieved due to the inverters' structure, consisting of several modules in combination with a wide range of available power classes. The *GeniusHWI* series inverters are available with air and water cooling. The function scope can be extended as required by combining the Genius welding control system with high-performance software packages. Even with its basic equipment, the system permits the visualisation of the last ten resistance, current and voltage curves to enable targeted process analysis.

Higher powers can be achieved with our *GeniusHWI3x40*, *GeniusHWI3x45* and *GeniusHWI3x60* series welding inverters. A master-slave configuration can also be implemented to operate several welding transformers simultaneously with one control system. The product variant descriptions are contained in the individual product sheets, "[Comparison of BAS, PRO and HAN functions](#)" on page 15.

## GeniusHWI3xyy

Fig. 2-4 *GeniusHWI3xxx* inverters

## Description

The *GeniusHWI3xyy* series inverters consist of a medium-frequency power unit with an integrated modular control system.

This series has been developed specifically for the high-current range.

Output classes	HWI3x40	HWI3x45	HWI3x60
Power input	400 / 440 V 3 ph, 480 V 3 ph		
Maximum output current	3000 A	3500 A	3500 A
Output current at 20% ED	1800 A	2200 A	2600 A
Output current at 100% ED	800 A	850 A	1300 A
Rated power at 20% ED	900 kVA	950 kVA	1300 kVA
Cooling	W = water		
Total weight	approx. 72 kg	approx. 72 kg	approx. 76 kg
Coolant requirement	6 l/min	6 l/min	8 l/min

## Basic software version (BAS)

The *GeniusHWI* product range offers maximum functionality for spot and projection applications. The "Basic" version is the perfect inverter for your standard machines.

Its basic equipment encompasses 24 V I/Os and one proportional valve. Constant current regulation, limit value monitoring and S inspector (travel) 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 programs
- 3 main current times (pre-heating, main and post-heating time)
- Digital 24 V I/O
- Constant current regulation (KSR)
- Electrode management
- Current increase, current decrease
- Pulses
- Proportional valve output
- Current limit value monitoring
- Visualisation of measured data
- Further interfaces, see machine and robot connections.



Fig. 2-5

*XPEGASUS user interface current parameter page*

## Including inspector module.

### S inspector (travel)

- Component control
- Sink-in travel
- Final dimension



Fig. 2-6 Setting for the  
*XPEGASUS user interface travel inspector*



Fig. 2-7 *GeniusHWI408W-PBS (with Profibus)*

## Professional (PRO) software version

For spot and projection applications with extended function scope

The *GeniusH<sup>WI</sup>* product range offers maximum functionality and flexibility. The "Professional" 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 programs.

The professional equipment also encompasses constant current regulation, a control stroke inspector and travel inspector as well as visualisation of the current, voltage and resistance curves of the last ten welding operations.

We have additionally integrated the current inspector, the voltage inspector and the resistance inspector into the professional equipment. At the same time, it can also be prepared for our IQR and PQS welding system.

Electrode management and proportional valve control are, of course, also included. Actuation 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 programs
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/Os
- Constant current regulation (KSR)
- Electrode management
- Current increase, current decrease
- Pulses
- Proportional valve output
- Current limit value monitoring
- Further interfaces, see options and equipment.



### S inspector (travel)

- Component control
- Sink-in travel
- Final dimension

### I inspector (current)

- Limit value
- Mean envelope value
- Reference envelope value

### U inspector (voltage)

- Limit value
- Mean envelope value
- Reference envelope value

### H inspector (control stroke)

- Limit value
- Mean envelope value
- Reference envelope value

### R inspector (resistance)

- Limit value
- Mean envelope value
- Reference envelope value

## Manual system (HAN) software version

The *GeniusHWI* product range offers maximum functionality and flexibility for manual spot applications. The "manual system" version is the professional for manual welding tasks to be undertaken in mechanical engineering.

Manual electrode holder mode enables welding using two different electrode holders. Each electrode holder has its own assigned programs, counters and signals. The function is parameterised using the user interface.

The electrode holders' welding processes are independent of each other; however, welding can only be carried out with one electrode holder. Welding with both electrode holders at the same time is not possible. If one electrode holder has a fault, welding can be performed using the other electrode holder. Each electrode holder has its own parameter set and its own signals.

As in the professional equipment, the manual version also encompasses constant current regulation, IQR, a control stroke inspector and travel inspector as well as visualisation of the current, voltage and resistance curves of the last ten welding operations. At the same time, it can also be prepared for our PQS welding system.

Electrode management and proportional valve control are, of course, also included. Actuation is planned via the I/O level. As standard, the inverters are equipped with an Ethernet interface, enabling you to network all devices.

The power connections for the *GeniusHWI406* to *GeniusHWI416* devices are designed with terminals. From *GeniusHWI424* to *GeniusHWI436*, connection rails are used.

## Standard function scope

- 2x4 programs
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/O
- Constant current regulation (KSR)
- Electrode management
- Current increase / current decrease
- Pulses
- Proportional valve output
- IQR adaptive regulation.



Fig. 2-8 *GeniusHWI408W-HAN-24V*

### I inspector (current)

- Limit value
- Mean envelope value
- Reference envelope value

### U inspector (voltage)

- Limit value
- Mean envelope value
- Reference envelope value

## Comparison of BAS, PRO and HAN functions

Function scope	GeniusHWI BAS	GeniusHWI PRO	GeniusHWI HAN
Operating concepts	PC with XPegasus operating software		
Programs	256	512	4
Welding profile	3 main current times VWZ, SZ, NWZ		
Current increase	Yes		
Current decrease	Yes		
Pulses	Yes		
I/Os	24 V I/O		
Electrode management	Yes		
1 proportional valve	Yes		
Visualisation of the last 10 measured data	Yes		
Constant current regulation KSR	Yes		
Current limit value monitoring	Yes		
S inspector (component contact, sink-in travel, final dimension monitoring)	Yes		No
I inspector (current envelope)	No	Yes	
U inspector (voltage envelope)	No	Yes	
H inspector (control stroke envelope)	No	Yes	No
R inspector (resistance)	No	Yes	No
IQP (adaptive regulation)	Optional		Yes
PQS (PQS-ready)	Optional		
AMC (ALU mode)	Optional		
BD - component documentation	Optional		
Q inspector	Optional		

## Inspectors

The inspectors are functions which enable various welding process parameters to be monitored. The inspectors' monitoring functions help to assure the quality of welding processes.

Depending on the software versions, certain inspectors are already enabled in the Genius inverter.

The inspectors are independent of each other. Depending on the choice of inspector, current, voltage, resistance, electrode force, control stroke, process stability, the component size and electrode travel plus the occurrence of spatter can be monitored:

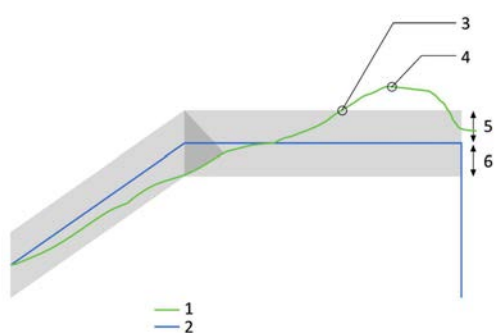


Fig. 2-9 Envelope with absolute tolerance

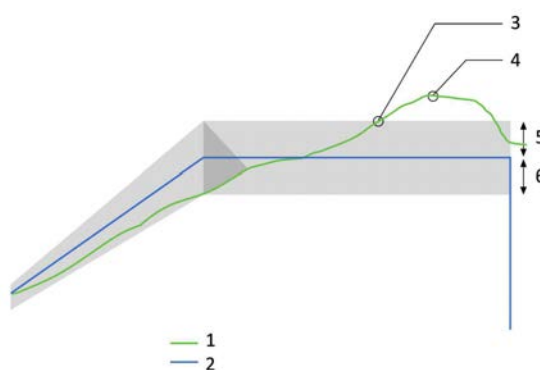


Fig. 2-10 Envelope with relative tolerance

- 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 value monitoring
- Voltage: U inspector
- Resistance: R inspector
- Force: F inspector
- Control stroke: H inspector
- Process stability: Q inspector
- Component control and travel measurement: S inspector
- Spatter: SP inspector



## I inspector (current)

The energy density available during the welding operation and the energy volume applied into the welding spot essentially determine the welded joint.

Monitoring the current curve of a welding operation therefore enables a statement to be made regarding the constant amperage and thus the quality of the welding operation.

The current curve arises due to the parameters set on the inverter, the characteristics of the welding facility and the component, which changes during welding.

The I inspector is used to detect deviations in the curve due to changes in the material characteristics or other influences such as e.g. mains voltage fluctuations.

During welding, the I inspector compares the current curve with a reference curve, and outputs a warning on exceeding a pre-selected tolerance or classifies the welding operation as faulty.

The reference curve can be formed from the control system's specified values or from the measured values of a welding operation classified as good.

Permissible deviations from a welding operation's reference curve are specified as envelopes. These can reveal a constant or a proportion distance from the reference curve.

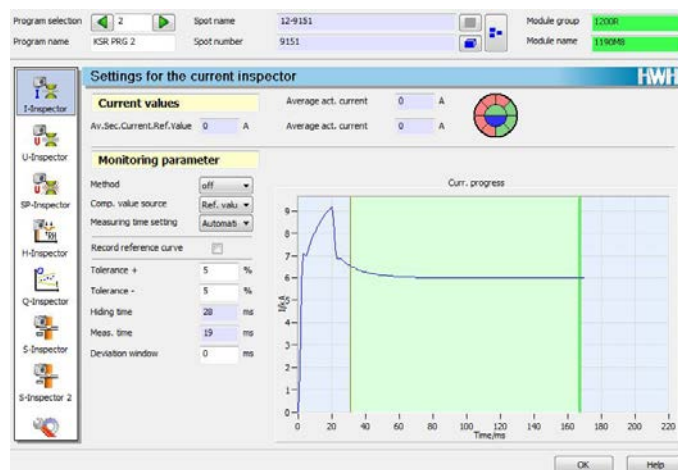


Fig. 2-11 X-Pegasus representation with open I inspector settings

## U inspector (voltage)

The voltage provided by the welding facility at the welding electrodes leads to a welding current at the material to be welded.

Monitoring the voltage curve of a welding operation provides information on a change in the system status or the material characteristics of the material to be welded.

During welding, the U inspector compares the voltage curve with a reference curve, and outputs a warning on exceeding a pre-selected tolerance or classifies the welding operation as faulty.

The reference curve can be formed from the control system's specified values or from the measured values of a welding operation classified as good.

Permissible deviations from a welding operation's reference curve are specified as envelopes. These can reveal a constant or a proportion distance from the reference curve.

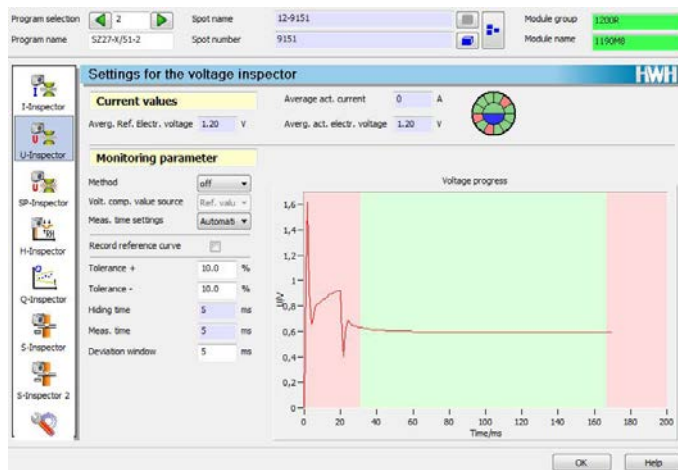


Fig. 2-12 X-Pegasus representation with open U inspector settings

## R inspector

The voltage provided by the welding facility at the welding electrodes leads to a welding current at the material to be welded.

The welding current leads to the development of heat, which changes the specific resistance of the material to be welded. The resistance curves over the material to be welded have typical characteristics.

During welding, the R inspector compares the resistance curve with a reference curve, and outputs a warning on exceeding a pre-selected tolerance or classifies the welding operation as faulty.

The reference curve can be formed from the control system's specified values or from the measured values of a welding operation classified as good.

Permissible deviations from a welding operation's reference curve are specified as envelopes. These can reveal a constant or a proportion distance from the reference curve.

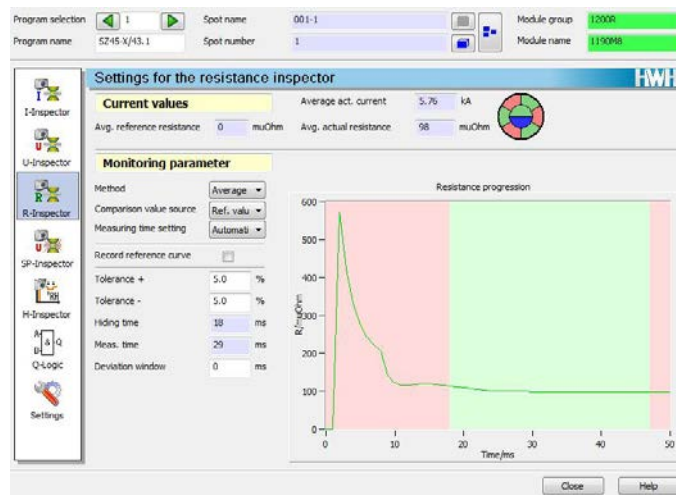


Fig. 2-13 X-Pegasus representation with open R inspector settings

## H inspector (control stroke)

Due to the use of control procedures, the actuating value (PWM pulse width) can be changed so that the welding current or welding voltage remain constant irrespective of interferences.

The change in the actuating value during a welding operation is an indication of the extent of influencing variables.

During welding, the H inspector compares the actuating value changes with a reference curve, and outputs a warning on exceeding a pre-selected tolerance or classifies the welding operation as faulty.

The reference curve can be formed from the control system's specified values or from the measured values of a welding operation classified as good.

Permissible deviations from a welding operation's reference curve are specified as envelopes. These can reveal a constant or a proportion distance from the reference curve.

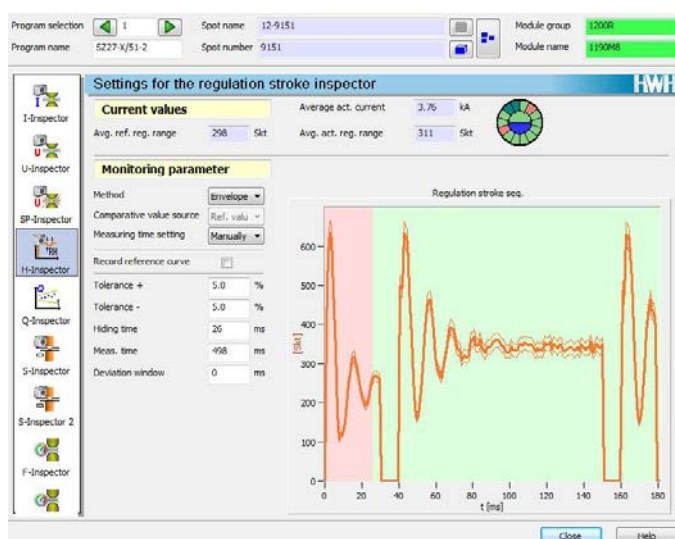


Fig. 2-14 XPegasus representation with open H inspector settings

## Q inspector (process stability)

The Q inspector compares a dynamic resistance curve of a welding operation with a previously formed reference and evaluates the similarity.

Particular focus is placed on the simplicity of operation here.

The reference is determined from checked welding processes and thus represents an optimised resistance curve. This reference is given the value 1 (100%). The similarity of each subsequent welding process is evaluated using an internal algorithm. This value is called the "spot value", and can be used as a monitoring parameter with an individually adjustable threshold. References for diverse welding jobs can be stored in a database and reloaded as required.

As information, the current resistance curve is formed depending on the reference during production. The user is also provided with an overview of past evaluations in a live process drift display.

The Q inspector is based on statistical data, and must therefore only be used with XPegasus Gold or a higher version, as the extended database enables optimal quality control over longer periods of time.

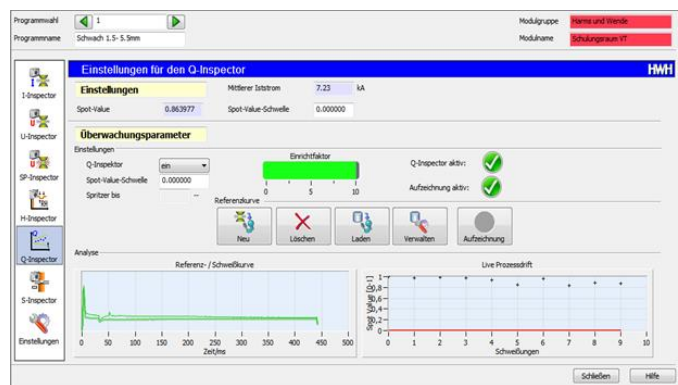


Fig. 2-15 XPegasus Q inspector interface

## S inspector (travel measurement)

Travel measurement monitors the electrodes' travel. This enables determination of whether the component has been inserted correctly. Movement of the electrodes is monitored during welding; at pre-specified travel marks, the current profile can be switched (profile indexing) to ensure that proper electrode sink-in to the specified final dimension or the specified sink-in travel.

### Characteristics / features

- Component control
- Sink-in travel monitoring
- Final dimension monitoring
- Profile indexing

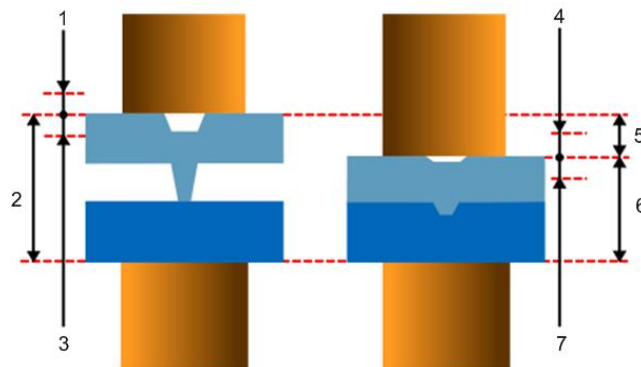


Fig. 2-16 Component control, Sink-in travel or final dimension monitoring

Component control		Sink-in travel monitoring		Final dimension monitoring	
1	+ Tolerance	4	+ Tolerance	4	+ Tolerance
2	Nominal component value	5	Nominal sink-in travel value	6	Nominal final dimension value
3	- Tolerance	7	- Tolerance	7	- Tolerance

The graphic shows:

- The position of the electrodes with an inserted component at the start of welding for determination of the actual component value.
- The position of the electrodes at the end of welding for determination of the actual sink-in travel value or the actual final dimension value.

## IQR adaptive regulation

Adaptive regulation IQR regulates the current during welding depending on the resistance curve or output curve. The aim is the elimination of interference variables in the welding process.

Welding time adaptation is controlled depending on the time point of maximum resistance. The most striking time point in the resistance curve is the end of the warm-up phase and the start of melting. As of this time point, the resistance curve begins to decline again, as the transition resistance between the materials is omitted and the electrode begins to sink in. We call this point the "maximum resistance".

This time point varies. It is dependent on the interference variables which influence heating. Influencing interference variables include e.g.:

- The electrode diameter
- The shunt conditions
- Mains voltage fluctuations
- Force losses due to poor fit



Fig. 2-17 XPEGASUS representation with IQR settings

As of the point in time of maximum resistance, the thus far increasing nominal current value from previous process information is maintained at its current level with a delay. This results in a respective, new welding output, depending on the interference variables, for the further welding operation process. Heating can be changed up to the maximum resistance by programming the starting current and the steepness of the increase, called the "aggressiveness". If this is not sufficient, as may occur in rare cases, the welding time can also be adapted depending on the maximum resistance. Intervention into the cycle time must be noted in this case. Experience has shown variations in variables of no more than  $\pm 5$  ms in robot applications.

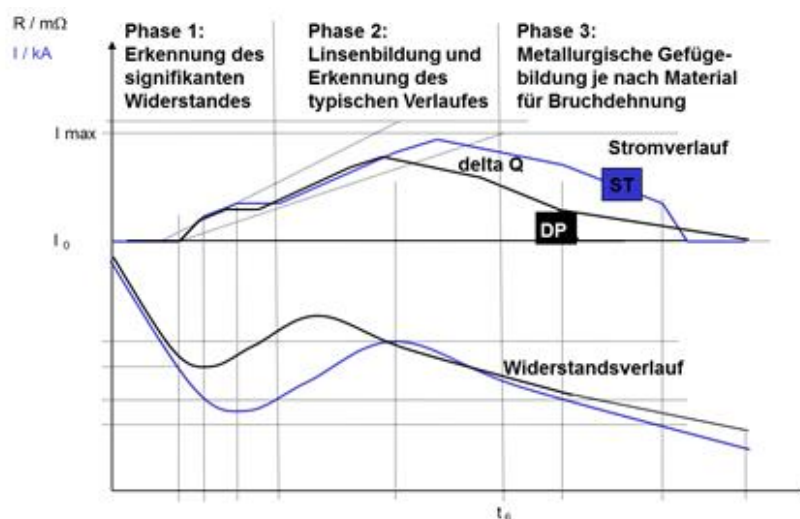


Fig. 2-18 Resistance curves

## PQS-ready – preparation for PQS licence

### Option: PQS-ready

The option PQS-ready offers you the integrated technical prerequisite for using PQS process monitoring for your spot and projection welding applications in the Genius system. The use of an additional QUADRIGO measurement module is forgone as a result.

The PQS-Res software licence required for data evaluation and analysis is not part of the PQS-ready option, and must be purchased separately. The licence 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 licence.

### 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
- Omission of additional hardware for measured value recording
- And if an Xcomand with process archive is used on an external PC.



## AMC - Aluminium Mode Classic

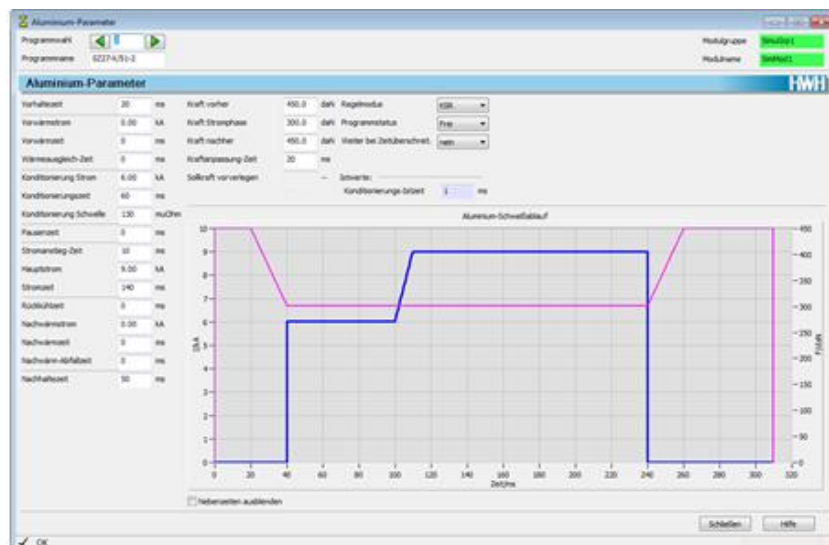


Fig. 2-19 XPegasus user interface aluminium parameters

## Description

Aluminium Mode Classic offers the basis for constant spot quality in aluminium alloy resistance welding. The unique combination of adaptive preconditioning and a controlled force profile has been developed specifically by Harms & Wende to meet the requirements of modern aluminium materials on the spot welding process. Aluminium Mode Classic is available as an option for all GeniusHWI inverters; as an aluminium parameter in XPegasus, it is embedded as a further control mode in the welding process.

Operation is carried out in compact form via an interconnecting operation page through the user interface. The control module forwards a nominal force profile value to the tool. In parallel, the current process is temporally controlled so that suitable pre-conditioning is monitored via the voltage measurement channel. Once this has been achieved, the actual current pulse occurs, followed by the further force profile process up to the end of the welding process.

Aluminium Mode Classic operates with adaptive preconditioning in combination with a controlled force profile in the welding process. For a typical welding profile in Aluminium Mode Classic. [See Fig. 2-19](#)

The process resistance is monitored continuously during the preconditioning current. On reaching a previously defined threshold value, preconditioning is regarded as completed, and the actual main current time begins. Due to the variable-time preconditioning pulse, identical starting conditions for the actual welding operation are created spot-by-spot.

Due to the lower material resistance, the currents required for aluminium welding are higher those for steel resistance spot welding. Harms & Wende therefore uses the high-performance, modular GeniusHWI series inverters for this application. The water-cooled power unit, which is dimensioned for a long service life, ensures continuous production at a high level.

The resistance monitoring integrated into the preconditioning phase in Aluminium Mode Classic indicates the stability of upstream processes, and recognises deviations early on before quality problems arise.

Aluminium welding has never been as simple and safe as with Aluminium Mode Classic from Harms & Wende.



## GeniusHWI product code

	GeniusHWI	B	U	LL	ww	zzz
<b>Family designation</b>						
<b>Design</b>						
<ul style="list-style-type: none"> <li>_ = inverter in design with dimensions 380x310x325 mm</li> <li>3 = inverter in design with dimensions 778x389*345 mm</li> </ul>		3				
<b>Supply voltage</b>						
<ul style="list-style-type: none"> <li>4 = 400 - 440 V 50/60Hz</li> <li>5 = 480 V 50/60Hz</li> </ul>			4			
			5			
<b>Output classes with cooling</b>						
<ul style="list-style-type: none"> <li>03L = 37 kVA</li> <li>03W or WA = 50 kVA</li> <li>06L = 70 kVA</li> <li>06W or WA = 110 kVA</li> <li>08L = 100 kVA</li> <li>08W or WA = 135 kVA</li> <li>13L = 165 kVA</li> <li>13W or WA = 195 kVA</li> <li>16L = 220 kVA</li> <li>16W or WA = 270 kVA</li> <li>24W = 385 kVA</li> <li>36W = 525 kVA</li> <li>2x24W = 500 kVA</li> <li>2x32W = 625 kVA</li> <li>3x40W = 900 kVA</li> <li>3x45W = 950 kVA</li> <li>3x60W = 1300 kVA</li> </ul>				03L		
				03W[A]		
				06L		
				06W[A]		
				08L		
				08W[A]		
				13L		
				13W[A]		
				16L		
				16W[A]		
				24W		
				36W		
				2x24W		
				2x32W		
				3x40W		
				3x45W		
				3x60W		
<b>Function scope</b>						
<ul style="list-style-type: none"> <li>BAS = basic</li> <li>PRO = professional</li> <li>HAN = manual systems</li> </ul>					BAS	
					PRO	
					HAN	
<b>Machine and robot connections</b>						
<ul style="list-style-type: none"> <li>See machine and robot connections table</li> </ul>						-zzz

## 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	PNlo
• ECT = EtherCAT	ECT
• EIP = Ethernet IP	EIP
• CAN = CANOpen	CAN
• CCL = CCLink	CCL
• DEV = DeviceNet	DEV

## Optional software functions -vv

### Genius optional software functions

• IQR = adaptive regulation.	IQR
• PQS = preparation for PQS licence	PQS
• QI = inspector for quality	QI
• AMC = Aluminium Mode Classic	AMC
• BD = prepared for component documentation via the fieldbus	BD

## Use of the product code

Family name example: **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.

Design example: GeniusHWI**3**545W-PRO-PNIE

In the example, a design with the dimensions 778x389\*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**45W**-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

The functional scope of the control system, which is essentially defined through the software equipment, is selected with the code "ww". The basic and professional function scopes differ e.g. due to the number of programs and the inspector equipment.

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.

### Note

If none of the specified profiles meets your requirements, however, we are able to customise the device characteristics for you. Contact us

## GeniusHWI inverter technical data

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

## GeniusHWI master-slave mode

Master-slave mode is particularly suitable for applications requiring a higher welding current. Systems with an output current of 250 kA have already proved suitable in practice.

The master operates e.g. as a GeniusHWI-Basic or GeniusHWI-Professional in the usual manner but additionally 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 output 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.



Master inverter



Slave inverter

Fig. 2-21 Control cabinet with GeniusHWI master/slave

## SlaveHWI product code

	SlaveHWI	B	U	LL
<b>Family designation / device name</b>				
<b>Design</b>				
<ul style="list-style-type: none"> <li>_ = MF inverter, small design (dimensions = 380x310x325 mm)</li> <li>2 = MF inverter, design (dimensions = 720x310x325 mm)</li> <li>3 = MF inverter, design (dimensions = 778x389*345 mm)</li> </ul>		2 3		
<b>Supply voltage</b>				
<ul style="list-style-type: none"> <li>4 = 400 - 440 V 50 / 60 Hz</li> <li>5 = 480 V 50 / 60 Hz</li> </ul>			4 5	
<b>Output classes</b>				
<ul style="list-style-type: none"> <li>x16L = 220 kVA</li> <li>x16W or WA = 270 kVA</li> <li>x24W = 365 kVA</li> <li>2x24W = 500 kVA</li> <li>2x32W = 625 kVA</li> <li>x36W = 525 kVA</li> <li>3x40W = 900 kVA</li> <li>3x45W = 950 kVA</li> <li>3x60W = 1300 kVA</li> </ul>				16L 16W[A] 24W 2x24W 32W 36W 40W 45W 60W





## PC operating software



Fig. 3-1 XPegasus Platinum user interface



Fig. 3-2 XPegasus Gold user interface

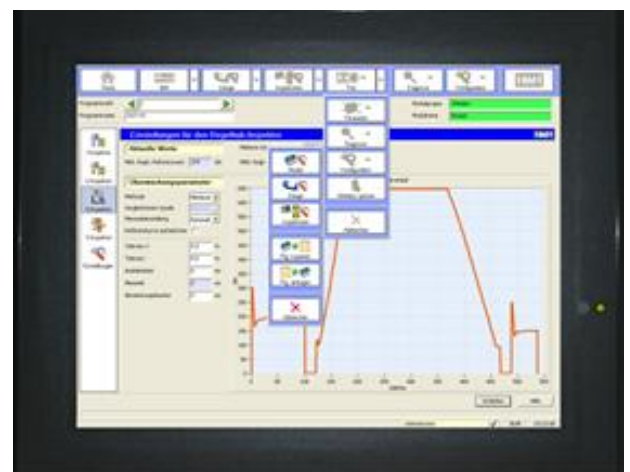


Fig. 3-3 Xcomand2

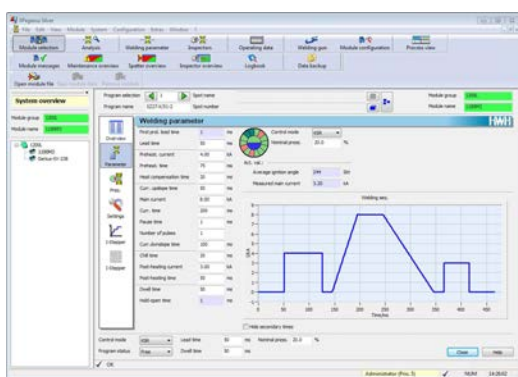
## XPegasus Silver edition

### Controlling and operating

The XPegasus Silver operating software offers options for controlling and operating your machines and systems. XPegasus Silver is the all-rounder with which you can quickly and efficiently set up your machine/system and monitor its operation.

### 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 error-free operation.



### Maintain an overview

Depending on application, XPegasus 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.



### Analyse your process

Your welding graphs are shown graphically. 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.

### The universal user interface

XPegasus slots perfectly into the Harms & Wende control systems. Use XPegasus to operate your

- GeniusMFI, GeniusHWI
- HWI EVA and EVA-IQR
- Ratia 73

Also in mixed mode, of course!

## XPegasus Gold edition

### Controlling, operating and archiving

The XPegasus Gold operating software offers options for controlling, operating and documenting your machines and systems. The XPegasus Gold programming software extends the functions of the XPegasus Silver edition with process monitoring, data evaluation and archiving.

#### Monitor your welding processes

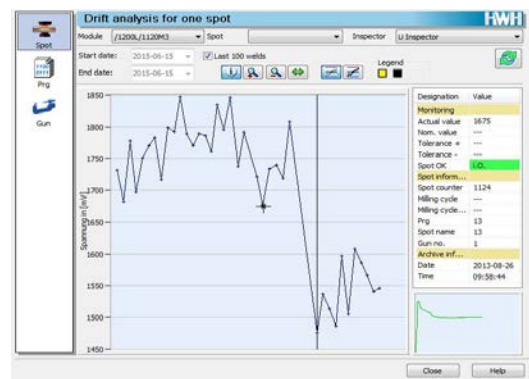
XPegasus Gold offers continuous monitoring of your welding process based on the inspectors available in your Genius inverter, i.e. the voltage, current, travel, resistance or control stroke inspector



#### 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.



#### 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

#### The universal user interface

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

Use XPegasus Gold to operate your

- GeniusMFI, GeniusHWI
- HWI EVA and EVA-IQR
- Ratia 43/73

Also in mixed mode, of course!

## XPegasus Platinum edition

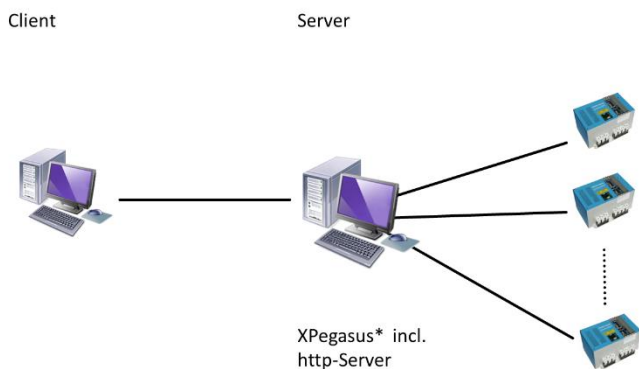
### Controlling, operating and archiving; as a server-client application

XPegasus Platinum offers all of the functions contained in XPegasus Silver and XPegasus Gold, extending them with a server. 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.

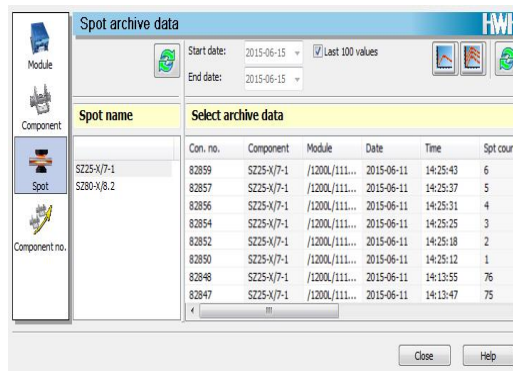
#### Monitor your welding processes

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!



Con. no.	Component	Module	Date	Time	Spt count
82859	SZ25-X/7-1	/1200L/111...	2015-06-11	14:25:43	6
82857	SZ25-X/7-1	/1200L/111...	2015-06-11	14:25:37	5
82856	SZ25-X/7-1	/1200L/111...	2015-06-11	14:25:31	4
82854	SZ25-X/7-1	/1200L/111...	2015-06-11	14:25:25	3
82852	SZ25-X/7-1	/1200L/111...	2015-06-11	14:25:18	2
82850	SZ25-X/7-1	/1200L/111...	2015-06-11	14:25:12	1
82848	SZ25-X/7-1	/1200L/111...	2015-06-11	14:13:55	76
82847	SZ25-X/7-1	/1200L/111...	2015-06-11	14:13:47	75

#### 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
- Ratia 43/73

Also in mixed mode, of course!

## **Xcomand2 - success with "touch"!**

The Xcomand2 has become established for operating the Genius system on the welding machine. The process view offers a very quick overview of the welding process and the last welding spots carried out. Xcomand2 enhances this performance even further. An even faster processor is used here, making operation even smoother. The colour touch display is available in 12" and 15" sizes.

Xcomand2 with process data archiving is ready to archive your welding data. Simply connect the Xcomand2 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**

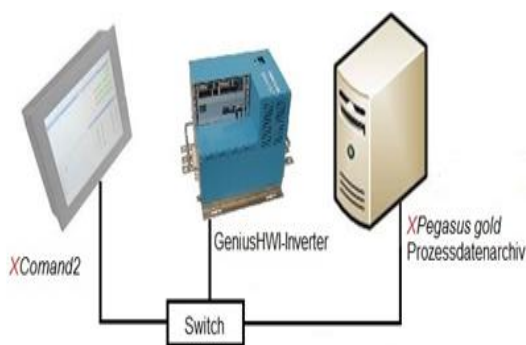


Fig. 3-4 Xcomand2 with process data archiving



Fig. 3-5 The colour Xcomand2 touch display

Thanks to the intuitive operating concept, you will become accustomed to Xcomand2 with ease. Whether in the control cabinet or as a stand-alone device, Xcomand2 can be seamlessly integrated into your system.

Individually adapt the Xcomand2 menu to your needs. This provides quick access to your most important input masks. The stable metal housing withstands even harsh ambient conditions.

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 XPegasus functions

XPegasus overview	XPegasus Silver	XPegasus Gold	XPegasus Platinum	Xcomand2
Parameterisation	X	X	X	X
Networking	X	X	X	-
Data archives (Genius)	-	X	X	Optional
Server integration	-	-	X	-

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

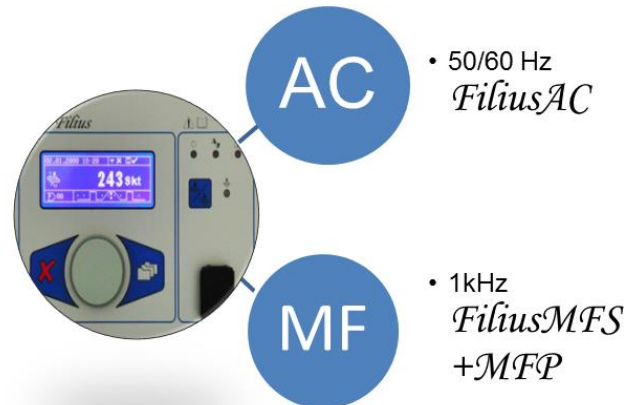
### Device versions supported by XPegasus

GeniusMFI GeniusHWI	All versions as of Genius firmware version 1.0
HWI 28xx	HWI 28xx from firmware version 8.22 (ZP from 8.18) or 9.45 with Ethernet interface (Not compatible with 9.x versions) archiving is not supported ZUP systems (electrode holder switching PCB) are not supported
Ratia73/43	Ratia73 from firmware version 5.10 or from 6.07 with Ethernet interface (not compatible with 6.x versions)

### The following PC equipment is recommended: XPegasus 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	XPegasus Silver/Gold XPegasus Platinum	40 modules permissible 60 modules permissible
Number of modules for extended database documentation & analysis	XPegasus Silver/Gold XPegasus Platinum	20 modules permissible 30 modules permissible

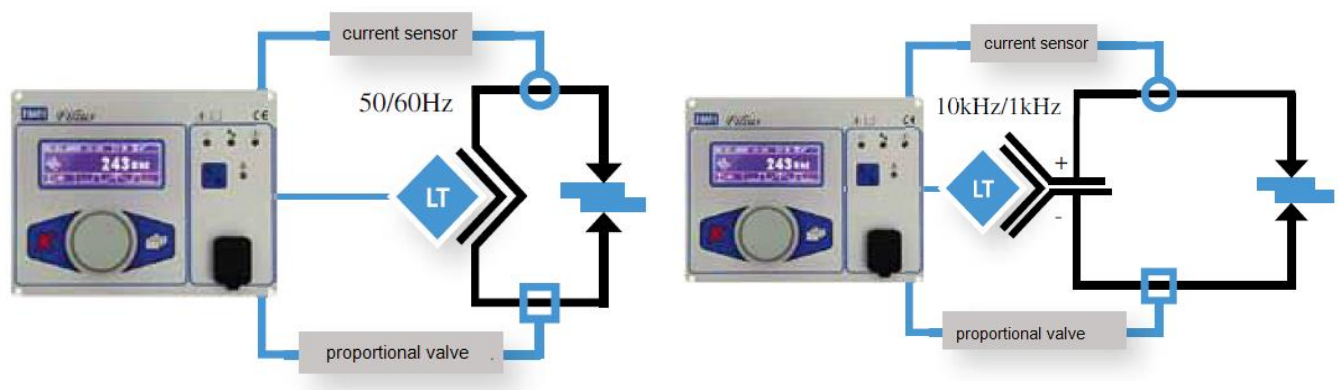
## Filius product series



## Characteristics

The Filius control systems are the perfect solution for your future resistance welding machine projects. Thanks to self-explanatory menu guidance plus comfortable back-up of your most important program data using a USB stick, fast commissioning is guaranteed.

Filius control systems can be combined with a variety of 1 kHz MF medium-frequency power units 50/60 Hz AC mains frequency output stages. The Filius control system is usually set up away from the power unit.



## Operating concepts

Integrated operation via comfortable menu guidance is characteristic of the Filius control system family.

FiliusRC (not included in the delivery scope) also enables control system parameterisation to be carried out anywhere in the system.



## Operation

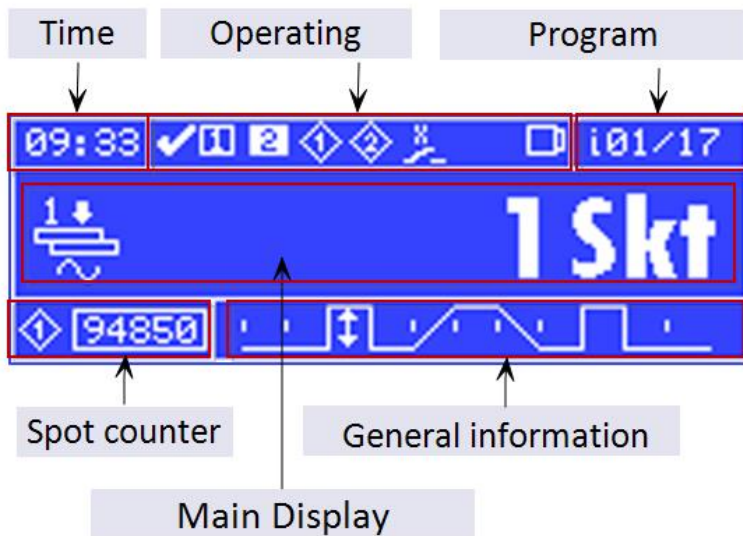


Fig. 4-1 *Filius* display

## Description

Various operating levels are available to the user. He can efficiently set basic parameters such as the welding time and welding current and, if necessary, also vary detailed welding parameters for setting individual welding processes. The welding programs can be stored in the internal memory.

Input is carried out directly via the integrated menus, which are selected by turning and pressing the jog wheel. Various rights for changing the control system configuration or welding parameters can be assigned to the user via keys on USB sticks.

Firmware updates or function extensions can be loaded comfortably using a USB stick.

The FiliusRC-Comand can be used to remotely control the control system's settings using a cable connection.



## System overview

The system designation is used to select the welding technology of the control system family. It is necessary to firstly define the power unit type and secondly select the control system for the power unit to be connected.

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

## Filius design forms

The Filius system can be supplied in several variants.

- On installation of the power unit in a machine frame, separating the power unit from the control system and operating unit is recommended. The "P" variants are required for these applications. On selection of these types, specification of the power, the primary supply voltage and the type of cooling is necessary.
- It is necessary to select a control system to be able to operate a power unit. There are several function modules which are hierarchically graduated. Control system modules can be installed in machine frames to offer the operator easy access on the machine. Control systems can be ordered in various designs.

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

## Classic function scope

For spot and projection applications and the seam function with an electrode holder and extended function scope.

The "Classic" version is the solution for automated welding jobs 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:

- Constant current regulation
- Current limit value monitoring
- Program sequences
- Pressure/force program with solenoid valve/proportional valve
- Current increase/stepper function

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 programs
- 3 main current times (pre-heating, main, post-heating time)
- Digital 24 V I/O
- Constant current regulation (KSR)
- Electrode management
- Stepper function
- Current increase current decrease
- Pulses
- Proportional valve output
- Current limit value monitoring
- Force/pressure program with MV2 and proportional valve
- Program sequence



### Travel monitoring

- Component control
- Sink-in travel
- Final dimension

### Stepper function

- Linearised stepper function with 10 supporting points

### Program sequences

- Up to 127 programs 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 jobs. 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:

- Constant current regulation
- Current limit value monitoring
- Travel 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 programs
- 3 main current times (pre-heating, main and post-heating time)
- Digital 24 V I/O
- Constant current regulation (KSR)
- Electrode management
- Current increase, current decrease
- Pulses
- 2 x proportional valve output
- Current limit value monitoring



### Travel monitoring

- Component control
- Sink-in travel
- 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 welding jobs. It is equipped with 24 V I/O, outputs 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 programs
- 3 main current times (pre-heating, main and post-heating time)
- Digital 24 V I/O
- Output for 1 solenoid valve, 1 pre-stroke valve
- Electrode management
- Current increase / current decrease
- Pulses



## Analogue function scope

For welding applications without program parameters. Time and current settings are specified to the control system via an analogue nominal value.

The "analogue" version is the solution if you have to change powers during the ongoing process due to the welding job. Important inputs such as the temperature contact, water monitor, release, ready and the stepping contact are made available to the control system with 24 V I/O.

The analogue IQ version includes the function:

- Constant current regulation

## Operating concept

Important control system configurations are carried out on the device's integrated front operating panel via comfortable menu guidance. The welding processes are defined through the specification of analogue nominal values.

## Standard function scope

- Program design through analogue value specification
- Digital 24 V I/O



## Comparison of functions

Variants (functionality)	Mono	Multi		Classic	
Functions	AC	AC	MF	AC	MF
Time input	Per./HW/ms	Per./HW/ms	1 ms	Per./HW/ms	1 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/Os	Yes				
Parameter back-up via USB	Yes				
USB in the front	Yes				
Programs	8	2*16		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			
Travel monitoring	No	Yes			
Remote control with FiliusRC	No	Yes			
Stepper function	No			Yes	
Pressure/force program	No			Yes	
Program sequence	No			Yes	

Product code

	Filius	CC	B	ww	zzz	VV
Family designation						
System designation						
<ul style="list-style-type: none"><li>Alternating current 50/60 Hz single-phase</li><li>Medium frequency 1 kHz, 3-phase, 50/60 Hz</li></ul>		AC MF				
Design						
<ul style="list-style-type: none"><li>Beta</li><li>Compact</li></ul>			S-B S-C			
Function scope						
<ul style="list-style-type: none"><li>Analogue</li><li>Mono</li><li>Multi</li><li>Classic</li></ul>				-Analogue -Mono -Multi -Classic		
Machine and robot connections						
<ul style="list-style-type: none"><li>I/O = 24 V I/O</li></ul>					-I/O	
Monitoring and regulation functions						
<ul style="list-style-type: none"><li>IQ = package with current monitoring + regulation</li></ul>						-IQ

## FiliusRC

Using Filius RC (Remote Command) operating units and a simple connection cable, parameterisation can also be carried out anywhere in the system.

The structure of the control system corresponds precisely to that of a FiliusACS-C-Mono. The displays on the FiliusRC correspond precisely to the displays of the control system selected for remote control. The control systems are networked via a separate CAN bus, and up to 8 control systems can be networked with one FiliusRC.

### Standard function scope

- Mini-chain
- Can be networked with CAN bus
- Supports the characteristics of the connected control systems





## MFP product series



Fig. 5-1 *MFP* power unit

### Description

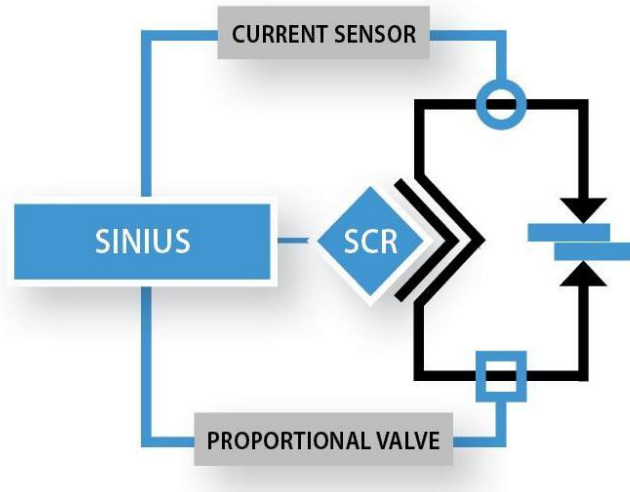
The *MFP* medium-frequency power units are intended for connecting to the *FiliusMFS* and *SmartMFS* control system families.

The power units are designed without any control function as simple current sources, and are connected to the control system with a simple cable. The *MFP* power stages are available in various expansion stages. The technical data can be found in the "[Appendix - technical data](#)" on page 117

## MFP product code / order designation

	MFP	B	U	LL
<b>Family designation / device name</b>				
<b>Design</b>				
<ul style="list-style-type: none"> <li>_ = MF power unit, small design (dimensions = 380x310x325 mm)</li> </ul>				
<b>Supply voltage</b>				
<ul style="list-style-type: none"> <li>4 = 400 - 440 V, 50 / 60 Hz</li> <li>5 = 480 - 500 V, 50 / 60 Hz</li> </ul>			4 5	
<b>Output classes</b>				
<ul style="list-style-type: none"> <li>03L = 37 kVA</li> <li>03W or WA = 50 kVA</li> <li>06L = 70 kVA</li> <li>06W or WA = 110 kVA</li> <li>08L = 100 kVA</li> <li>08W or WA = 135 kVA</li> <li>13L = 165 kVA</li> <li>13W or WA = 195 kVA</li> <li>16L = 220 kVA</li> <li>16W or WA = 270 kVA</li> </ul>				03L 03W[A] 06L 06W[A] 08L 08W[A] 13L 13W[A] 16L 16W[A]

## Sinius product series



## Description

The new Sinus welding processor product range offers you new scope in designing your machine and application. Whether in a complex system or as a single station system, visualisation is carried out with your own user interface on your PLC. As a new interface between the PLC and power units, the Sinus welding processor undertakes execution of the welding process. All Sinus welding processors can be equipped with different fieldbus variants to the PLC.

To do this, you use the familiar PLC components to visualise and control welding processes in production. As the entire functionality of your welding process is stored in your PLC, all know-how remains in your company.

Sinius welding processors undertake precise and reliable execution of the selected joining process. You are free to choose the desired welding technology, whether this be 10 kHz high frequency, 1 kHz medium frequency or 50/60 Hz mains frequency.

## System structure

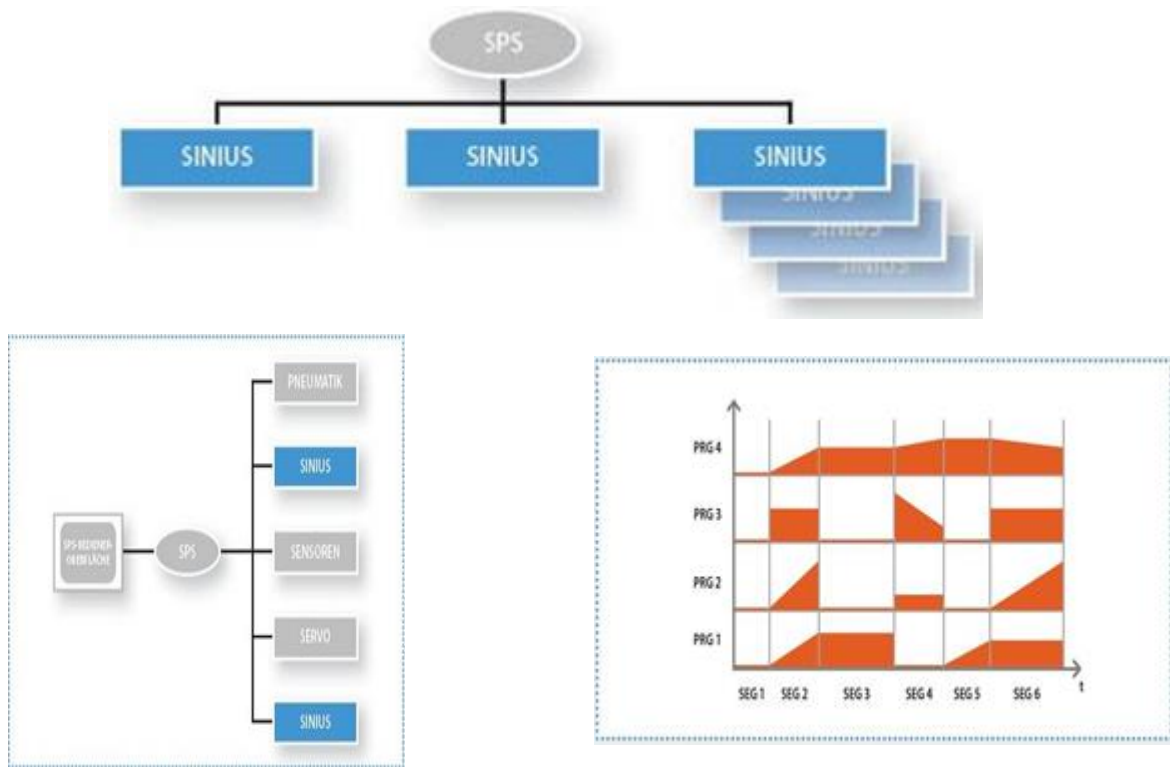


Fig. 6-1 System structure with *Sinius*

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:

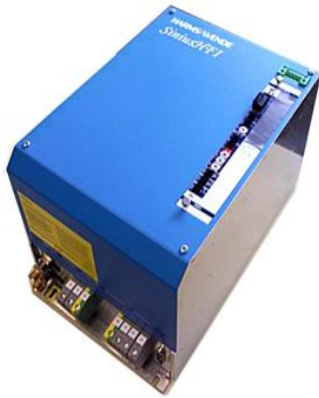
- 8 programs
- 10 time segments, freely programmable via PLC
- Current regulation
- Proportional valve

Your advantages:

- Inexpensive
- Simple operation
- High flexibility
- Same PLC adaptation for different welding technologies

## Assemblies

Inverter technology 10 kHz



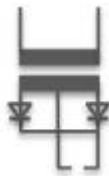
Inverter technology 1 kHz



50/60 Hz thyristor technology



HF transformer [DC]



MF transformer [DC]



Thyristor output stage

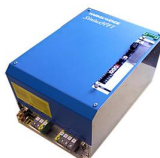



AC transformer [AC, DC]

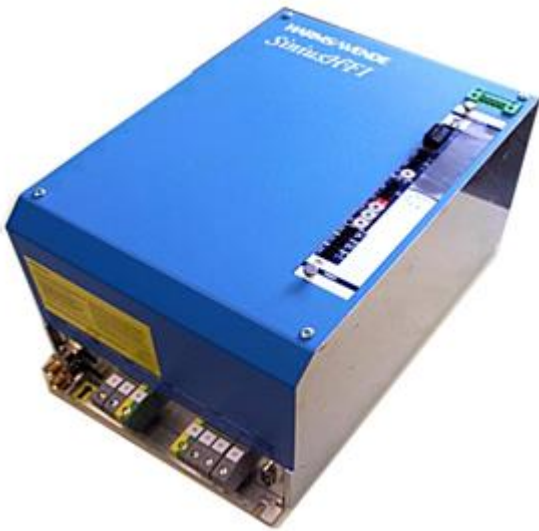


- Reduction of commissioning and operating costs
- Individual operation / safe handling of the machine
- Individual message assistant
- Remote control also includes the technology module

## Comparison of functions

Function scope Sinus	HFI	HWI	AC1	AC3
Images				
Power unit	Integrated	Integrated	External	
Welding transformer	10 kHz DC technology	1 kHz DC technology	50 Hz / 60 Hz AC technology	
Current type	Direct current	Direct current	Alternating current	Direct current
Non-regulated mode	Yes			
Mains voltage compensation	Yes			
Current regulation	Yes	Yes	Yes	No
Regulation	Yes	No	No	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	Yes	Yes	Yes
Machine and robot connection	PBS, PN1e, PN1o, ECT, CAN, CCL, DEV			
Dimensions	Approx. 240x400x245 mm	Approx. 310x406x245 mm	Approx. 45x120x135 mm	

## SiniusHFI inverters



The SiniusHFI welding processor offers you extensive flexibility in designing the user interface of your planned resistance welding machine.

### Application:

Typical SiniusHFI applications include automated systems in micro-welding. Visualisation on your own user interface runs on the PLC user interface and can be adapted directly to the welding job. Whether in fast micro-welding in a complex system or as an individual station system, everything runs with your own user interface on your PLC

No user interface familiarisation time – thanks to your own user interface – individually adaptable at any time later on. Fully integrated into the machine control system PLC or also separately – however you want it.

Current, voltage and power regulation are available to the welding process and can be switched over as desired within the ten time segments during the welding process.

The SiniusHFI cabling has been reduced to a minimum – CANOpen, Profibus or EtherCat with just one cable.

Your advantages: inexpensive – easy operation – high flexibility

## SiniusHWI inverters



The SinusHFI welding processor offers you flexibility in designing the user interface of your planned resistance welding machine.

### Application:

Typical SinusHWI applications include automated systems in which resistance welding processes are used. 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 job, everything runs with your own user interface on your PLC

No user interface familiarisation time – thanks to your own user interface – individually adaptable at any time later on. Fully integrated into the machine control system PLC or also separately – however you want it.

The SinusHWI covers the entire range of welding inverter power classes available at Harms & Wende. The range starts at 20 kVA, extending 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



## SiniusAC

Welding the elegant way

- Flexible
- Individual

SiniusAC can be used in the area of grid welding as well as for spot and projection welding jobs.

SiniusAC 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



SiniusAC 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 three-phase DC current.

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

SiniusAC 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 stage 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

## Sinius product code

	SiniusHWH	B	U	LL	zzz
<b>Family designation</b>					
<b>Design</b>					
<ul style="list-style-type: none"> <li>_ = inverter in design with dimensions 380x310x325 mm</li> <li>2 = inverter in design with dimensions 720x310x325 mm</li> <li>3 = inverter in design with dimensions 778x389*345 mm</li> </ul>		2 3			
<b>Supply voltage</b>					
<ul style="list-style-type: none"> <li>4 = 400 - 440V 50 / 60 Hz</li> <li>5 = 480 - 500V 50 / 60 Hz</li> </ul>			4 5		
<b>Output classes</b>					
<ul style="list-style-type: none"> <li>03L = 37 kVA</li> <li>03W or WA = 50 kVA</li> <li>06L = 70 kVA</li> <li>06W or WA = 110 kVA</li> <li>08L = 100 kVA</li> <li>08W or WA = 135 kVA</li> <li>13L = 165 kVA</li> <li>13W or WA = 195 kVA</li> <li>16L = 220 kVA</li> <li>16W or WA = 270 kVA</li> <li>24W = 385 kVA</li> <li>36W = 525 kVA</li> <li>2x24W = 500 kVAA</li> <li>2x32W = 625 kVA</li> <li>3x40W = 900 kVA</li> <li>3x45W = 950 kVA</li> <li>3x60W = 1300 kVA</li> </ul>				03L 03W[A] 06L 06W[A] 08L 08W[A] 13L 13W[A] 16L 16W[A] 24W 36W 2x24W 2x32W 3x40W 3x45W 3x60W	
<b>Machine and robot connections</b>					
<ul style="list-style-type: none"> <li>See machine and robot connections table</li> </ul>					-ZZZ

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

	SiniusHFI4	LL	aa	zzz
<b>Family designation</b>				
<b>Output classes</b>				
<ul style="list-style-type: none"> <li>HFI404 = high-frequency inverter 10 kHz 40 kVA</li> <li>HFI407 = high-frequency inverter 10 kHz 70 kVA</li> </ul>	04 07			
<b>Cooling</b>				
<ul style="list-style-type: none"> <li>W = water-cooled</li> </ul>			W	
<b>Machine and robot connections</b>				
<ul style="list-style-type: none"> <li>See machine and robot connections table</li> </ul>				-zzz

	Machine and robot connections	-zzz
<b>Machine and robot connections</b>		
<ul style="list-style-type: none"> <li>I/O = 24 V I/O</li> <li>PBS = Profibus DP electrical</li> <li>PNle = Profinet electrical</li> <li>PNlo = Profinet optical</li> <li>ECT = EtherCAT</li> <li>EIP = Ethernet IP</li> <li>CAN = CANOpen</li> <li>CCL = CCLink</li> <li>DEV = DeviceNet</li> </ul>		I/O PBS PNle PNlo ECT EIP CAN CCL DEV

## SiniusHWI master-slave mode

Master-slave mode is particularly suitable for applications requiring a higher welding current. Systems with an output current of 250 kA have already 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 output 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.



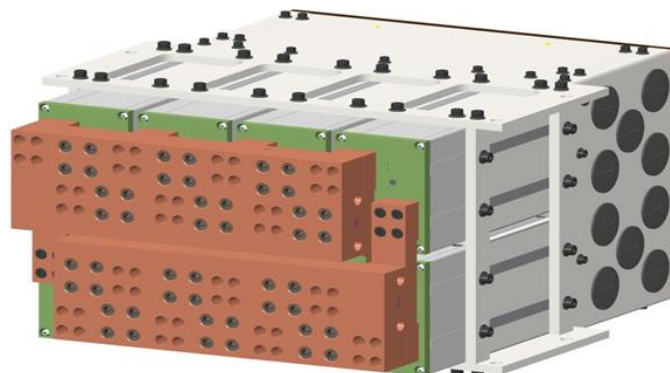
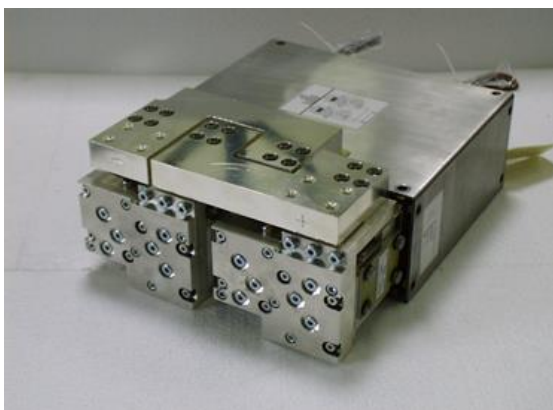
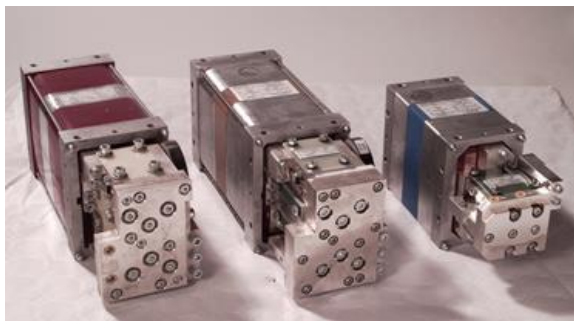
**Fig. 6-3** Special system, maximum welding current 300 kA, SiniusHWI 3460 master system with three slave inverters

## SlaveHWI product code

	SlaveHWI	B	U	LL
<b>Family designation / device name</b>				
<b>Design</b>				
<ul style="list-style-type: none"> <li>_ = MF inverter, small design (dimensions = 380x310x325 mm)</li> <li>2 = MF inverter, design (dimensions = 720x310x325 mm)</li> <li>3 = MF inverter, design (dimensions = 778x389*345 mm)</li> </ul>		2 3		
<b>Supply voltage</b>				
<ul style="list-style-type: none"> <li>4 = 400 - 440 V 50 / 60 Hz</li> <li>5 = 480 V 50 / 60 Hz</li> </ul>			4 5	
<b>Output classes</b>				
<ul style="list-style-type: none"> <li>x16L = 220 kVA</li> <li>x16W or WA = 270 kVA</li> <li>x24W = 365 kVA</li> <li>2x24W = 500 kVA</li> <li>2x32W = 625 kVA</li> <li>x36W = 525 kVA</li> <li>3x40W = 900 kVA</li> <li>3x45W = 950 kVA</li> <li>3x60W = 1300 kVA</li> </ul>				16L 16W[A] 24W 2x24W 32W 36W 40W 45W 60W



## Welding 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 power 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 electrode holders 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 terminal box

Optional equipment:

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

### MF transformer suggestion for inverter power class xHWI403

Rated power at 20% ED	Sec. voltage [V] 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	Approx. 3 kA	Approx. 5 kA

### MF transformer suggestion for inverter power class xHWI406

Rated power at 20% ED	Sec. voltage [V] 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	Approx. 3 kA	Approx. 5 kA
Transformer – 80 kVA	6.3 - 6/2	Approx. 12 kA	Approx. 18 kA

### MF transformer suggestion for inverter power class xHWI408

Rated power at 20% ED	Sec. voltage [V] diode type/number	Welding current at 20% ED	Welding current at 5% ED
Transformer – 80 kVA	6.3 - 6/2	Approx. 12 kA	Approx. 18 kA
Transformer – 90 kVA	8.3 - 6/2	Approx. 12 kA	Approx. 18 kA
Transformer – 130 kVA	9.4 - 10/2	Approx. 14 kA	Approx. 21 kA

### MF transformer suggestion for inverter power class xHWI413



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

### MF transformer suggestion for inverter power class xHWI416

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

### MF transformer suggestion for inverter power class xHWI424

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

### MF transformer suggestion for inverter power class xHWI436

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

MF transformer suggestion for inverter power class xHWI440

Rated power at 20% ED	Sec. voltage [V] diode type/number	Welding current at 20% ED	Welding current at 5% ED
Transformer – 300 kVA	8.9 - 13/4	Approx. 21.2 kA	Approx. 51 kA
Transformer – 500 kVA	13.2 - 13/4	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 xHWI445

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

MF transformer suggestion for inverter power class xHWI460

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

HF welding transformers

Application areas:  
Welding transformers for 10 kHz actuation



Fig. 7-1 Welding transformers for 10 kHz actuation

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.

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. These welding transformers for 10 kHz actuations are required for the SiniusHFI, FiliusHFI and GeniusHFI systems.

Standard equipment:

- Primary voltage 530 V, 10 kHz
- Attached rectifier set
- Integrated current measurement coil
- Temperature monitoring for transformer and diodes
- Design without terminal box
- Other transformers and terminal boxes on request

Designation with sec. voltage	Sec. voltage [V] diodes	Rated power [kVA, 20% ED]	Max. short circuit current [kA]
HFT transformer	11.1	120	6

## Welding transformer accessories

Article	Designation	Description
16265	Terminal box	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	Terminal box	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 kVA
25024	Protective resistor	Fault current protective resistor 1 kOhm

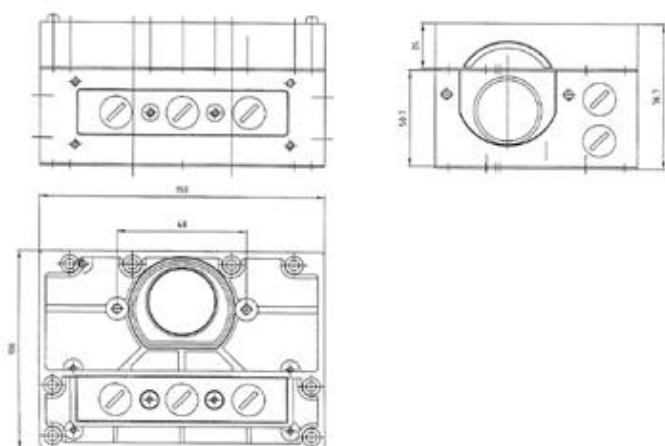


Fig. 7-2 Terminal box 16265

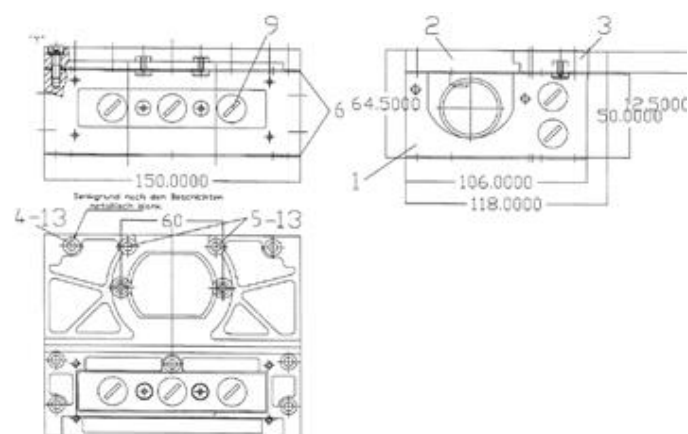







Fig. 7-3 Terminal box 16266

## Overview of mains frequency systems

Sinius	MPS10	FiliusAC	Ratia43	Ratia73
				

## 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 one-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.

## Ratia43/73 and MPK43/73 product series



Fig. 8-1 Ratia73



Fig. 8-2 Ratia43



Fig. 8-3 Control cabinet MPK43

## 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
- Constant secondary current regulation
- AC current
- Current monitoring with adjustable tolerance
- Current monitoring with adjustable spot repetition

### I/O level bus connections

- 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 X Pegasus software
- Travel measurement via X Pegasus OPC

## Ratia 73 product codes

	Ratia73	Type	K	L	mm
<b>Family designation</b>					
<b>Function type</b>					
<ul style="list-style-type: none"> <li>IQ0 = without regulation and limit value monitoring</li> <li>IQ1 = with AC regulation and limit value monitoring</li> <li>IQ2 = with DC regulation and limit value monitoring</li> </ul>		IQ0 IQ1 IQ2			
<b>Programming interface</b>					
<ul style="list-style-type: none"> <li>0 = no interface</li> <li>1 = RS422 interface</li> <li>5 = RS422 interface</li> </ul>			0 1 5		
<b>Machine and robot connection</b>					
<ul style="list-style-type: none"> <li>1 = 24 V I/O</li> <li>3 = Profibus DP electrical</li> <li>4 = Interbus S electrical</li> <li>5 = Interbus S optical</li> </ul>				1 3 j4 5	
<b>Fieldbus protocol</b>					
<ul style="list-style-type: none"> <li>00 = Standard</li> </ul>					00



### Mundus

The control unit with automatic recognition of the Ratia73 functional scope.

The functions of welding control systems are becoming increasingly complex and the desire for optimal adaptation is increasing.

In daily operation, however, minimum operating effort and clear parameter representation or measured value display are needed.

Reduction to what is necessary

Large graphical display for simple and clear basic programming; displayed data can also be reduced.

The "mini-chain" function enables up to four Ratia73 units to be operated using one Mundus.



Fig. 8-4 *Mundus beta*

#### Mundus / Ratia73 version

- Mundus alpha (Ratia73) D/GB/I/E
- Mundus alpha (Ratia73) D/GB/F/PL
- Mundus alpha (Ratia73) D/GB/CS/PL
- Mundus beta (Ratia73) D/GB/I/E
- Mundus beta (Ratia73) D/GB/F/PL
- Mundus beta (Ratia73) D/GB/CS/PL
- Mundus compact (Ratia73) D/GB/I/E
- Mundus compact (Ratia73) D/GB/F/PL

## Ratia43α product series



Fig. 8-5 Ratia43α

### Ratia43α standard equipment: multi-function welding control system with integrated operating unit

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Two-line display with plain text display</li> <li>• Menu guidance</li> <li>• Function keys</li> <li>• Password protection</li> <li>• Direct process and error information</li> <li>• Regulation range limit</li> <li>• 128 programs</li> <li>• 128 counter groups</li> <li>• Current and pressure program</li> <li>• Proportional valve actuation</li> <li>• Electrode management (stepper)</li> <li>• Menu in 3 languages - de, en and fr</li> </ul> | <ul style="list-style-type: none"> <li>• Automatic 50 / 60 Hz recognition</li> <li>• 2 starting functions</li> <li>• 2 x solenoid valve and pre-stroke outputs</li> <li>• Rework or milling program</li> <li>• Interface for parameter printout</li> <li>• Mains voltage compensation</li> <li>• Half wave operation</li> <li>• I/O connection via 24 V</li> <li>• Supply voltage 24 V DC</li> </ul> |
|--|--|

### Ratia43α IQ1 additional equipment

- Constant secondary current regulation for AC current
- Current monitoring with adjustable spot repetition
- Regulation range monitoring

### Ratia43α special functions

- 10 free current profiles
- Supply voltage 27 VAC

### Ratia43α IQ2 additional equipment

- Constant secondary current regulation for AC current
- Current monitoring with adjustable spot repetition
- Regulation range monitoring

### Options:

- Seam mode with profile indexing, time or event controlled
- Travel measurement

## Ratia43 product codes

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

## MPS10 product series



Fig. 8-6 MSP10

## Description

The MPS10 welding control system is a programmable five-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"> <li>• Five-time control system (VHZ, SZ, NHZ, OHZ, PZ) and additional SAZ as well as pulses</li> <li>• Selectable single spot and serial spot operating modes</li> <li>• Eight programs</li> <li>• Two start inputs</li> <li>• Two solenoid valve outputs and one pre-stroke output</li> <li>• Automatic 50/60 Hz recognition</li> <li>• Automatic equalisation of mains voltage fluctuations</li> <li>• Adaptation of the control system and welding processes to welding system conditions</li> <li>• Display of status and error messages during the welding process</li> <li>• With/without "current" switching via button</li> </ul>

## 50/60 Hz power stages



Fig. 9-1 LE26, LE100



Fig. 9-2 LE11



Fig. 9-3 LE7/1

## Description

Power stages, 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 three-phase versions of proven welding thyristors to supplement the three-phase welding control systems from HWH.

## LE11

The LE 11 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 LE 11 output stage is designed for operating all HWH 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 des.	Additional des.	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

Use:

Thyristor power stage for installation in control cabinets

Appropriate for control stages: Ratia73/43, FiliusACS and MPS10. For installation on the base plate with or without cover. They are available in output classes 125 A, 580 A, 1135 A with water cooling and in 45 A and 200 A with air cooling.

The standard connection voltages are: 400 V, 415 V, 440 V, 500 V.



Fig. 9-4 LE100 thyristor power stage



Fig. 9-5 LE200 thyristor power stage with cover

LE 100

Basic des.	Additional des.	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, LE26S1

Welding thyristors with extended protection

Thyristor power unit for welding cases and central cabinets, appropriate for Ratia 73, Ratia 43, FiliusACS and MPS10 welding control systems. For space-saving installation in cabinets with water cooling and insulated design with discharge resistor, thyristor actuation and 27 VAC supply transformer with hand-safe cover.

All-round protection with power thyristors

Man and the system are effectively protected against the effects of current thanks to stable mechanical housings and a partially insulated coolant circuit. Unwieldy and bulky covers and special hoses with safety lengths are not

necessary (LE26, LE200). Finger protection, contact protection, tool protection and insulated water cooling system are just a few of the key words applicable to this series' thyristor power units.

Water remains outside!

Thanks to the practical water connection on the rear side, hoses or pipe connections in the cabinet can be omitted entirely when installation is carried out accordingly. Coolant is prevented from escaping into the cabinet (LE26, LE200).

The standard connection voltages are: 400 V, 415 V, 440 V, 500 V.



Fig. 9-6 LE26 thyristor power stage

Basic des.	Additional des.	Current	Voltage to	Cooling
LE26S1	280	280 A	500 V	Water
LE26S1	580	580 A	500 V	Water



**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 V AC supply transformer.

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



Fig. 9-7 LE7/1

Basic des.	Additional des.	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 Ratia73/43 and SiniusAC3. For installation in a housing, e.g. on the base plate, with water cooling, type E2 discharge resistors and 27 V AC supply transformer.

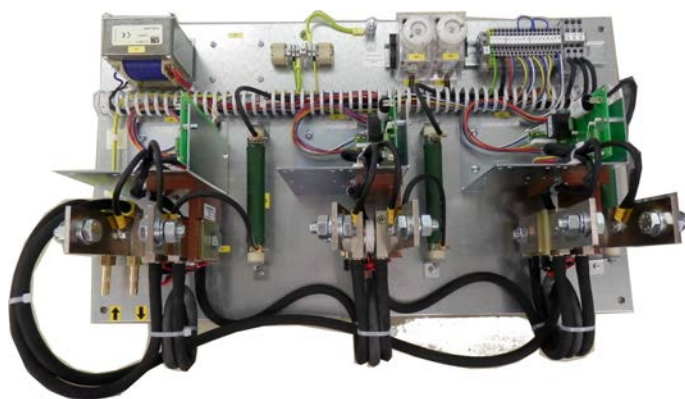


Fig. 9-8 LE10/3

Basic des.	Additional des.	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

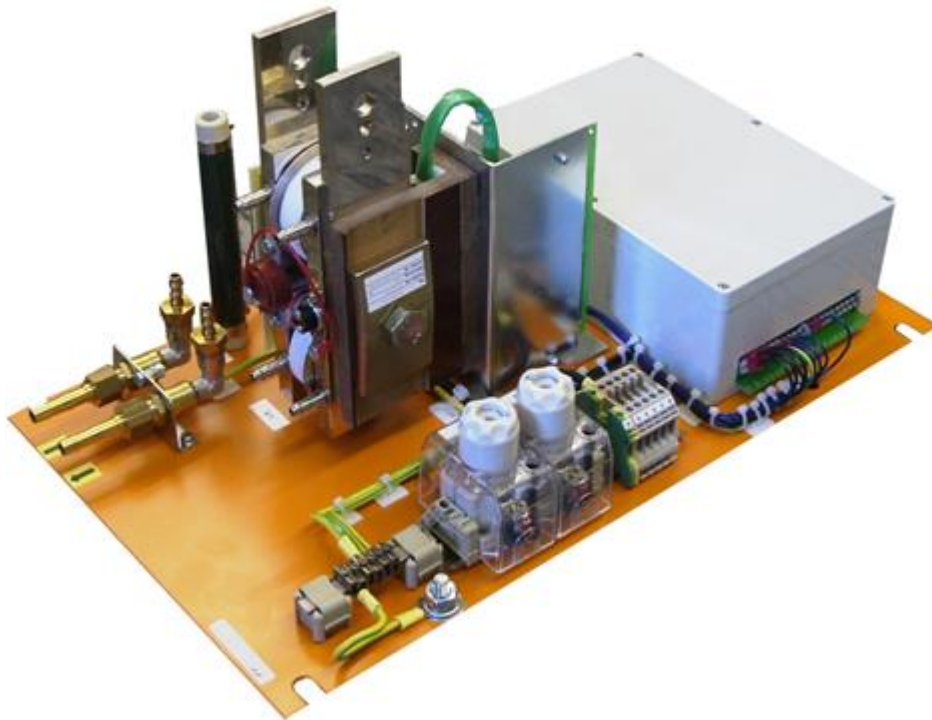
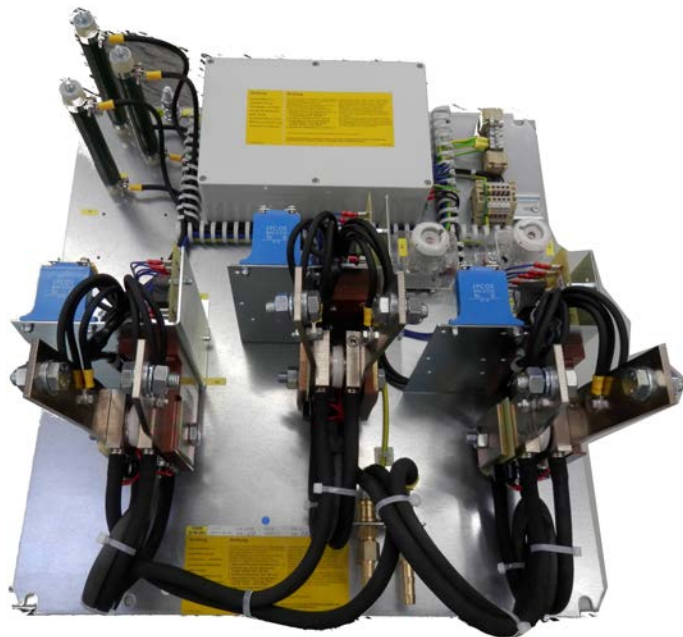


Fig. 9-9 LE20 thyristor power stage

Basic des.	Additional des.	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. 9-10** *LE20/3 three-phase thyristor power stage*

Basic des.	Additional des.	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

## Control cabinet construction



### 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



Table 10-1 SK-SiniusHWI

### Description

A control cabinet from HWH 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 also 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 HWH 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) 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. 10-1 Top mounted robot cabinet, interior view

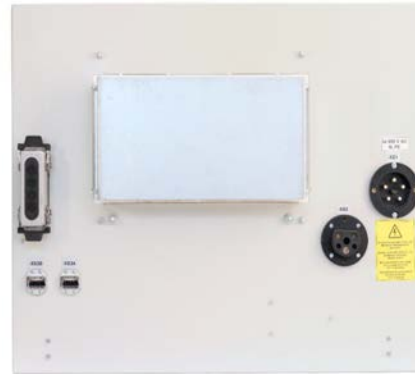


Fig. 10-2 Top mounted robot cabinet, rear view

## 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.



## Wall-mounted cabinets



**Fig. 10-3** Wall-mounted spot welding system, interior view



**Fig. 10-4** Wall-mounted spot welding system, operating elements



**Fig. 10-5** Wall-mounted spot welding system, connections

## Description

Manually guided electrode holders and welding systems developed specifically for this can be found in automotive engineering around the world. Whether for manual production of series production bodies or the use of manually guided welding tools in prototype engineering, HWH HPA manual spot welding systems offer the right solution. The combination of a powerful Genius inverter, the event controlled IQR process control system and a bespoke control cabinet with integrated operating elements is ideal for these applications. The manual spot welding systems with Genius inverter can be supplier pre-parameterised for a number of welding jobs; correspondingly coded connectors enable error-free assembly. This enables fast commissioning with minimal effort – "welding out of the box".

The HPA wall-mounted spot welding system from HWH is based on the powerful GeniusMFI series inverters. The requirements on a manually guided welding system are met thanks to an intelligent housing design. Signal lamps and buttons integrated into the housing floor or door quickly and reliably indicate the current status of the system to the operator. The operating elements enable the uncomplicated selection of important functions such as electrode management and milling unit control. To save valuable space in the production shop, wall mounting with operating elements integrated into the floor is appropriate for HPA manual welding systems.

## Floor-standing cabinets



**Fig. 10-6** Control cabinet with electrode holder changeover



**Fig. 10-7** 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 systems 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. 10-8 Welding hollow sections

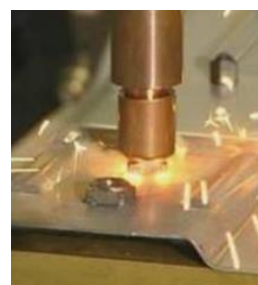


Fig. 10-9 Welding nuts

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

- Inverter: GeniusHWI416W-EA-PRO
- Cabinet: F-100A-600x760x350
- 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)
- Upslope
- Downslope
- Impulses
- Proportional valve output
- Limit value monitoring
- Stationary operation with Xcomand control unit, installed at front
- IP54 housing
- Supply voltage 3x400 V 50/60 Hz



## Manual spot and high-current systems

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



**Fig. 10-10** Control cabinet for connecting two welding machines, switchable via contactor.



**Fig. 10-11** Control cabinet with four medium-frequency inverters with individual main switches



**Fig. 10-12** Control cabinet for suspended spot welding system

## SK-Filius



## Characteristics and functions

The SK-Filius welding cabinet is equipped with the Filius welding control system and power units. All components are contained in a robust and compact housing. The SK-Filius can be used in existing and new machines, and completely replaces the MPK200 families. Thanks to the USB stick, the parameters can be easily transferred to the next system or archived on a PC.

## Available components

Characteristics	
Welding control system	FiliusACS
Supply voltage	400 VAC, 500 VAC / 50Hz / 60Hz
Air-cooled power units	45 A and 200 A
Water-cooled power units (AC)	125 A, 580 A and 1135 A (others on request).
Steel housing	700 x 500 x 250 mm (H x W x D)
Colour	RAL 7035
Power switch	<ul style="list-style-type: none"> <li>• Depending on thyristor power</li> <li>• (Delivery without is also possible)</li> </ul>
Option for viewing window	Robust aluminium frame with lock

## Product code

The standard SK series control cabinets are used in all product families. They are equipped with a main switch and power supply for supplying the undervoltage triggering function. Depending on use, they are e.g.:

Use	Example product designation
With an inverter	SK-GeniusHWI408L-PNle-63A-600x760x350
With an inverter and a control unit	SK-GeniusHWI403L-EA-F-63A-600x760x350 SK-FiliusMFS-416WA-L-100A-600x1200x400
With a 50/60 Hz welding control system and a power stage	SK-Ratia73

Composition of the relevant control cabinet characteristics:

Designation	Operation	Main switch		Control cabinet dimensions
		63 A	100 A	
63A-600x600x350 *	Without	X		600x600x350 mm
63A-600x760x350	Without	X		600x760x350 mm
100A-600x600x350 *	Without		X	600x600x350 mm
100A-600x760x350	Without		X	600x760x350 mm
100A-600x1200x400	Without		X	600x1200x400 mm

\* Only with air or external water cooling up to 160 kVA inverter

Designation	Operation	Main switch			Control cabinet dimensions
		250 A	400 A	630 A	
250A-600x760x350	Without	X			600x760x350 mm
250A-600x1200x400	Without	X			600x1200x400 mm
400A-600x1200x400	Without		X		600x1200x400 mm
630A-600x1200x400	Without			X	600x1200x400 mm

\* Only with air or external water cooling up to 160 kVA inverter

## Control cabinet options

Material	Description
Comfort housing	Adapted housings can be mounted directly for various types; Kuka KRC1/2; ABB; etc.
Terminal strip for connections	All connections routed via terminals as an alternative to direct application to the welding control system and power unit
Pluggable connections (up to 180 A primary current.)	Output via MC and I/Os via Harting connectors
Mating connectors	Mating connector set for plug connections
Secondary circuit monitoring facilities	Fault voltage monitoring with HWH SI10
Secondary circuit monitoring facilities	Fault current monitoring with differential current relays
Mains supply output	Mains output fused for milling units
Mains supply output	Mains output fused for robots
Mains supply output	Service socket
Indicator lamps and buttons	Error, error reset
Machine control system package	Two-hand control system





## Accessories

### Current and force measuring device TE 1600

Mobile measurement with know-how. Do you always know the amount of 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 TE 1600, you always have all data at your disposal.



**Fig. 11-1** TE 1600 force with current measuring belt and force measuring probe

Particularly during the set-up phase, this device offers all information required to set 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 TE 1600 for 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 TE 1600 versions

Designation	Description
TE 1600 current with measuring belt 1635	Portable current measuring device
TE 1600 force with force measuring probe 1675	Portable force measuring device, max. 1200 daN
TE 1600 multi with measuring belt and force measuring probe	Portable current/force measuring device Optional measurement of current (1635) and force (1675)

Upgrades / replacement parts	Description
Current measuring belt 1635	Measuring belt for TE 1600, open with quick-action lock, diameter approx. 160 mm
Force measuring probe 1673	Manual force measuring probe for TE 1600, max. 200 daN, 10 mm
BNC cable	For connecting an oscilloscope to the TE 1600, length 1 m

With our mobile measuring device TE 1600, you always have all data at your disposal.

## distance measurement



Fig. 11-2 distance measuring potentiometer

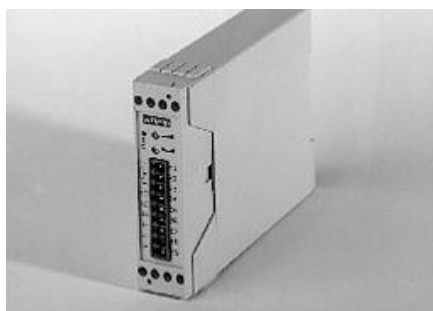


Fig. 11-3 Measuring transducer

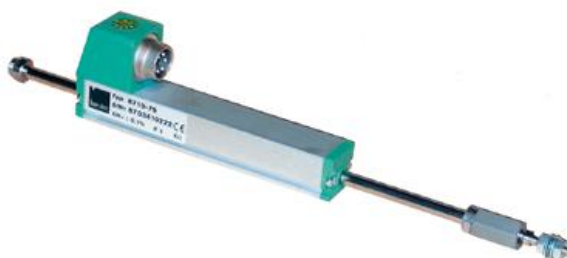


Fig. 11-4 distance measuring potentiometer 100 mm

Article	Name	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.

## Transformer switchover



## Description / application

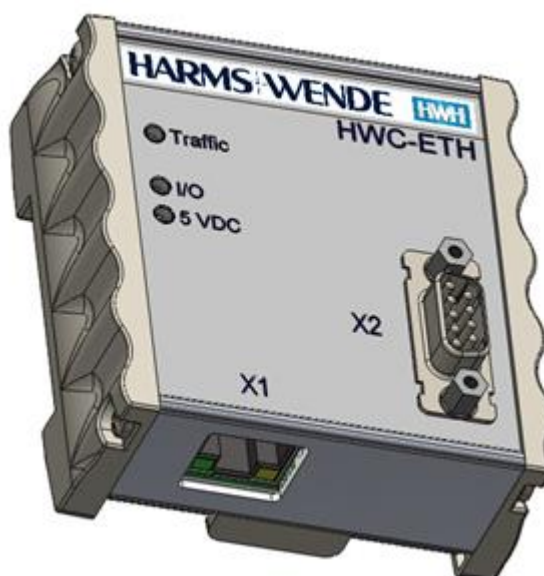
The HWU-2 welding transformer switchover enables the operation of several welding transformers on one MF power unit. For example, this enables the execution of two Welding jobs in succession either through the use of two welding cylinders or two separate machines.

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

## Technical data

Power input:	U – V:	MF: 50 – 800 V -15% + 20%, 100 Hz – 25 kHz
Output voltage:	U1 – V1:	Power input – 4 V -10% ... +20%
	U2 – V2:	Load- and temperature-dependent
Maximum output current:		1200 A for $t_s \leq 10$ ms max. 15% ED See limit value chart for further output currents.
Supply voltage:		24 V DC -10% ... +20%, 200 mA
Control connection:	X1	Green control voltage on LED
Relay output:		Normally closed contact max. 250 V AC, 2.5 A
Heat sink temperature:		Red excess temperature heat sink LED

## HWC-ETH module



**Fig. 11-5** 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 user interface (Pegasus/~~X~~Pegasus). 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, Sinus, analogue and slave functionality is not permissible.
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 licence.

## 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

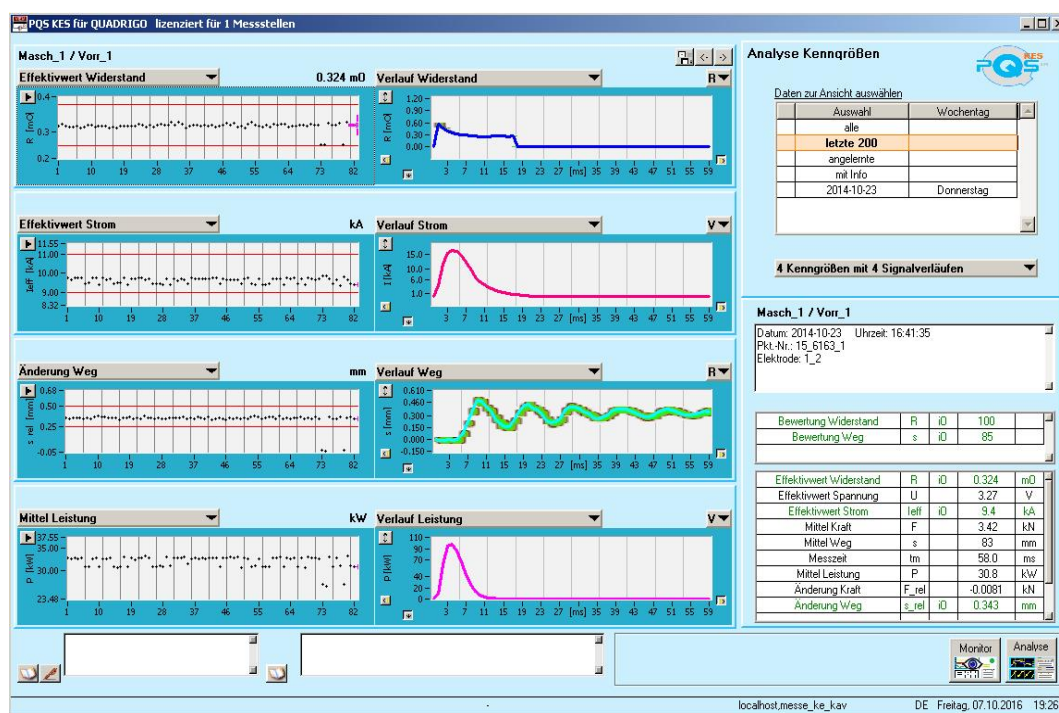


Fig. 11-6 PQS-Res software parameter analysis window

## 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 **X**Pegasus software.

Various performance classes are available as required. 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

Fig. 11-7 QUADRIGO-Master

### Basic equipment:

- For top-hat rail fastening, 24 V supply
- On-board graphics adapter with DVI connection
- Dual Ethernet adapter with 2x 100/1000 GB Ethernet
- 1x serial interface RS232 and 4 USB 2.0 ports
- Active cooling through quick-exchange fan cassette with speed monitoring
- Can be installed in our QUADRIGO box with a QUADRIGO measurement module
- UPS preparation including external battery pack



## QUADRIGO-VISU



Fig. 11-8 QUADRIGO-VISU

The QUADRIGO-VISU is an industrial panel PC with Windows operating system. The PQS software package for system operation, but also for 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 XPeGegasus 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.

For the built-in panel PCs, a keyboard can be integrated into a built-in drawer.

Depending on customer requirement, the VISU can also be integrated into your production with a mounting stand

### Basic equipment:

- Protection type IP65, tilting keyboard with touch pad
- Temperature range 0 to 45°C, passive cooling
- 24 V supply, UPS integrated, external battery
- Win.7, Intel i5, 4 GB RAM, 320 GB HDD



Fig. 11-9 QUADRIGO-VISU-Plus V002 with mounting stand



## Academy



## Description

As an international company, we offer 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"> <li>• Resistance welding</li> <li>• General welding technology</li> </ul>	
Device technology	
<ul style="list-style-type: none"> <li>• Components of the welding technology used</li> </ul>	
Operating software	
<ul style="list-style-type: none"> <li>• System messages</li> <li>• Behaviour in the event of a fault</li> <li>• Who can help me?</li> </ul>	
Duration:	3 days
Place:	Harms & Wende GmbH & Co. KG Großmoorkehre 9 D-21079 Hamburg
Maximum number of subscribers	3-8 subscribers

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

## 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

- Resistance welding
- General welding technology
- General parameterisation

#### Device technology

- Components of the welding technology used
- Behaviour of the control system

#### Operating software

- Basic parameters
- Module configuration
- Data back-up
- 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

#### Maximum number of subscribers

3-8 subscribers

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

## 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

- Resistance welding
- General welding technology
- General parameterisation

#### Device technology

- 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

- Basic parameters
- Module configuration
- Data back-up
- 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

#### Maximum number of subscribers

3-8 subscribers



## Key user training

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



## Services

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

- Software creation
- Commissioning
- Customer service assignments
- 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 HWH welding facility	Invoicing unit
Machine hour, use of HWH welding facility, without provision of a technician	Per hour
Service and machine hour Use of HWH welding facility, with provision of a technician for operation and parameterisation	Per hour
Machine day, 1 day, 8 h, use of the HWH welding facility, without provision of a technician	Per day
Service and machine day, 1 day, 8 h, use of the HWH 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
- SinusHWI,
- SlaveHWI
- MFP

Not all performance classes are available in the device profiles.

In performance 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.

## Inverter x03L - x08L

The current and power values specified are maximum allowable values.

Output classes	403	503	406	506	408	508
Cooling	Air					
Power input 3 ph	400 / 440 V	500 V	400 / 440 V	500 V	400 / 440 V	500 V
Mains frequency	50 Hz / 60 Hz					
Working frequency	1000 Hz					
Maximum output current [10 ms]	100 A		400 A		600 A	
Output current at 20% ED <sup>1)</sup>	75 A		140 A		200 A	
Output current at 100% ED <sup>1)</sup>	35 A		65 A		90 A	
Rated output voltage	500 / 550 V	600 V	500 / 550 V	600 V	500 / 550 V	600 V
Power at 20% ED <sup>2)</sup>	37 kVA		70 kVA		100 kVA	
Primary continuous current <sup>3)</sup>	26 A		48 A		65 A	
Ambient temperature	+10°C to max. +40°C					
Relative humidity	Max. 90% and no condensation					

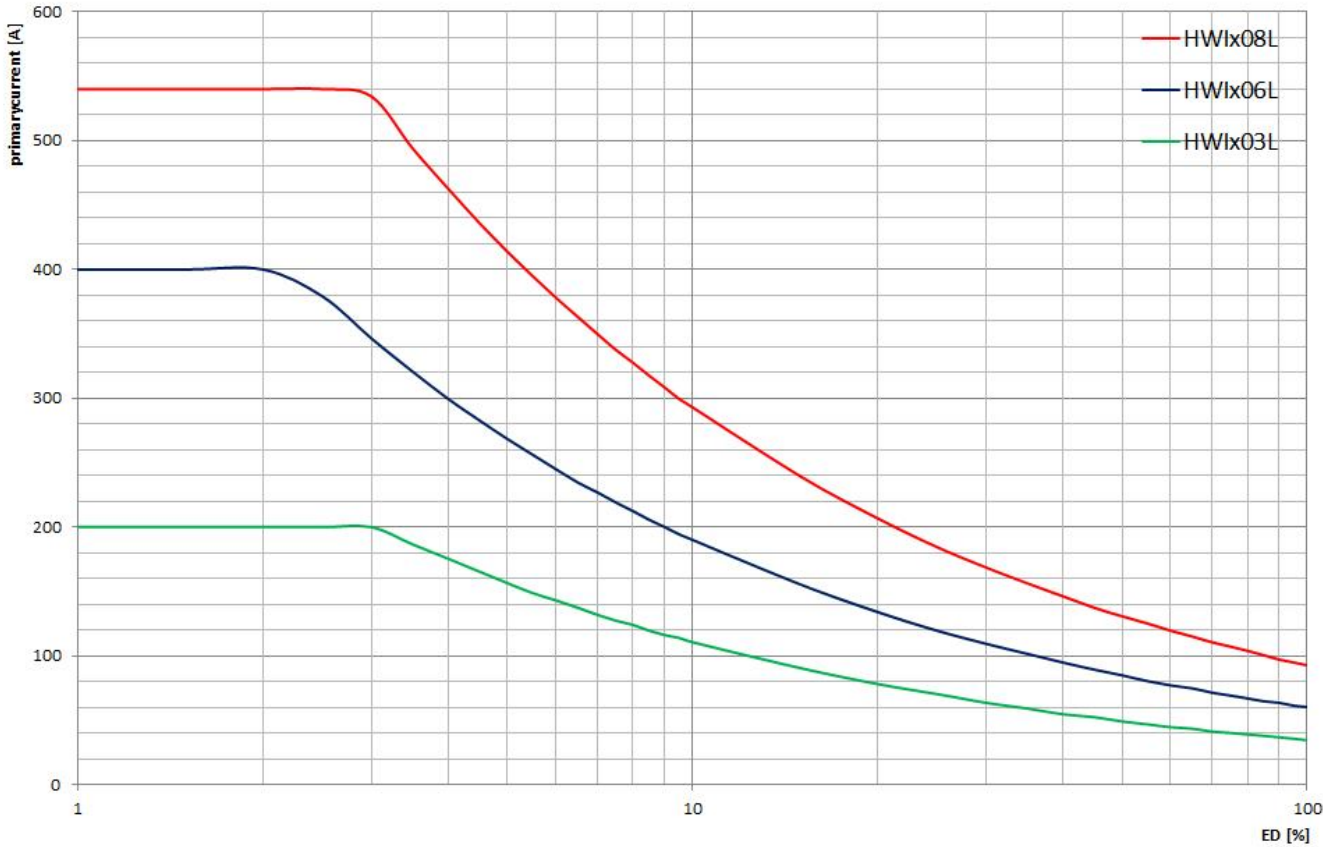
<sup>1)</sup> Peak current is specified.

<sup>2)</sup> The apparent power at 500 V mains voltage is specified.

<sup>3)</sup> Conductor current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application.

### Limit value chart x03L - x08L

The current and power values specified are maximum allowable values.



## Inverter x13L -x16L

The current and power values specified are maximum allowable values.

Output classes	413	513	416	516
Cooling	Air			
Power input	400 /440 V	500V	400 /440 V	500V
Mains frequency	50 Hz / 60 Hz			
Working frequency	1000 Hz			
Maximum output current [10 ms]	800 A		1200 A	
Output current at 20% ED <sup>1)</sup>	330 A		440 A	
Output current at 100% ED <sup>1)</sup>	150 A		200 A	
Rated output voltage	500 / 550 V	600 V	500 / 550 V	600 V
Power at 20% ED <sup>2)</sup>	165 kVA		220 kVA	
Conductor current <sup>3)</sup>	105 A		140 A	
Ambient temperature	+10°C to max. +40°C			
Relative humidity	Max. 90% and no condensation			

<sup>1)</sup> Peak current is specified.

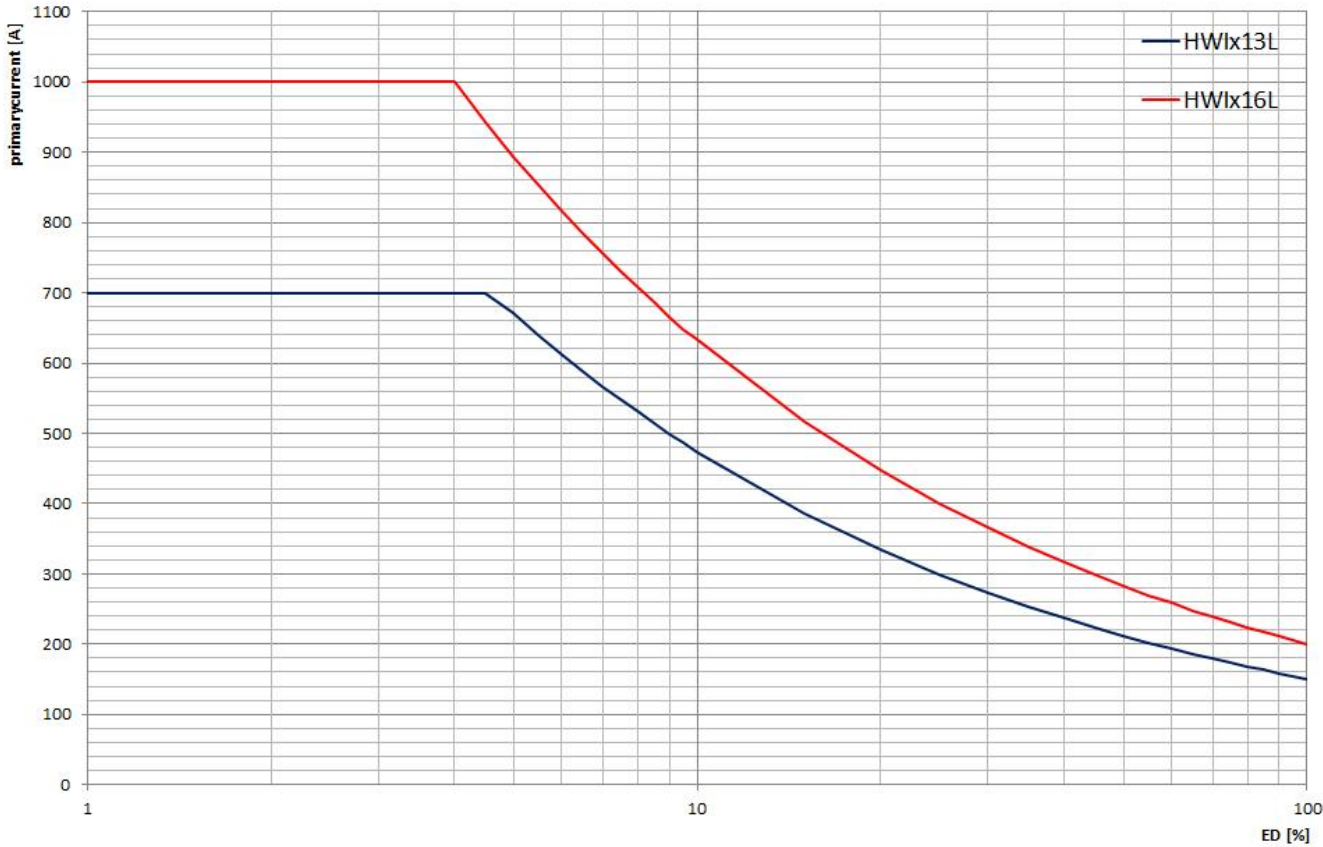
<sup>2)</sup> The apparent power at 500 V mains voltage is specified.

<sup>3)</sup> Conductor current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application.



Limit value chart x13L - x16L

The current and power values specified are maximum allowable values.



## Inverter x03W[A] - x08W[A]

The current and power values specified are maximum allowable values.

Output classes	403	503	406	506	408	508
Cooling	W = water / WA = water externally					
Power input 3 ph	400 / 440 V	500 V	400 / 440 V	500 V	400 / 440 V	500 V
Mains frequency	50 Hz / 60 Hz					
Working frequency	1000 Hz					
Maximum output current [10 ms]	100 A		400 A		600 A	
Output current at 20% ED <sup>1)</sup>	100 A		220 A		270 A	
Output current at 100% ED <sup>1)</sup>	45 A		100 A		120 A	
Rated output voltage	500 / 550 V	600 V	500 / 550 V	600 V	500 / 550 V	600 V
Power at 20% ED <sup>2)</sup>	50 kVA		110 kVA		135 kVA	
Primary continuous current <sup>3)</sup>	30 A		75 A		90 A	
Ambient temperature	+10°C to max. +40°C					
Relative humidity	Max. 90% and no condensation					

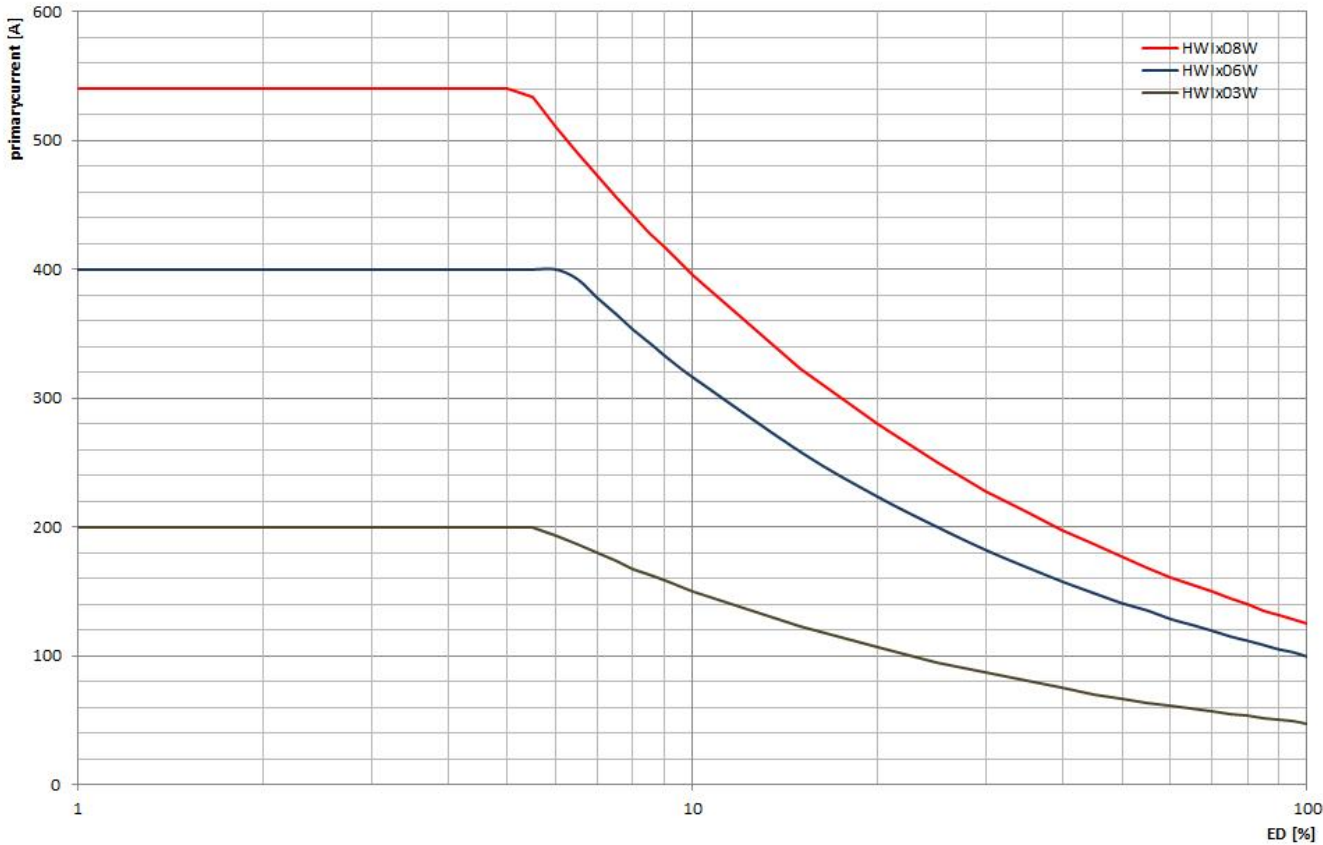
<sup>1)</sup> Peak current is specified.

<sup>2)</sup> The apparent power at 500 V mains voltage is specified.

<sup>3)</sup> Conductor current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application.

Limit value chart x03W[A] - x08W[A]

The current and power values specified are maximum allowable values.



## Inverter x13W[A] - x16W[A]

The current and power values specified are maximum allowable values.

Output classes	413	513	416	516
Cooling	W = water / WA = water externally			
Power input 3 ph	400 / 440 V	500 V	400 / 440 V	500 V
Mains frequency	50 Hz / 60 Hz			
Working frequency	1000 Hz			
Maximum output current [10 ms]	800 A		1200 A	
Output current at 20% ED <sup>1)</sup>	390 A		540 A	
Output current at 100% ED <sup>1)</sup>	177 A		240 A	
Rated output voltage	500 / 550 V	600 V	500 / 550 V	600 V
Power at 20% ED <sup>2)</sup>	195 kVA		270 kVA	
Primary continuous current <sup>3)</sup>	130 A		170 A	
Ambient temperature	+10°C to max. +40°C			
Relative humidity	Max. 90% and no condensation			

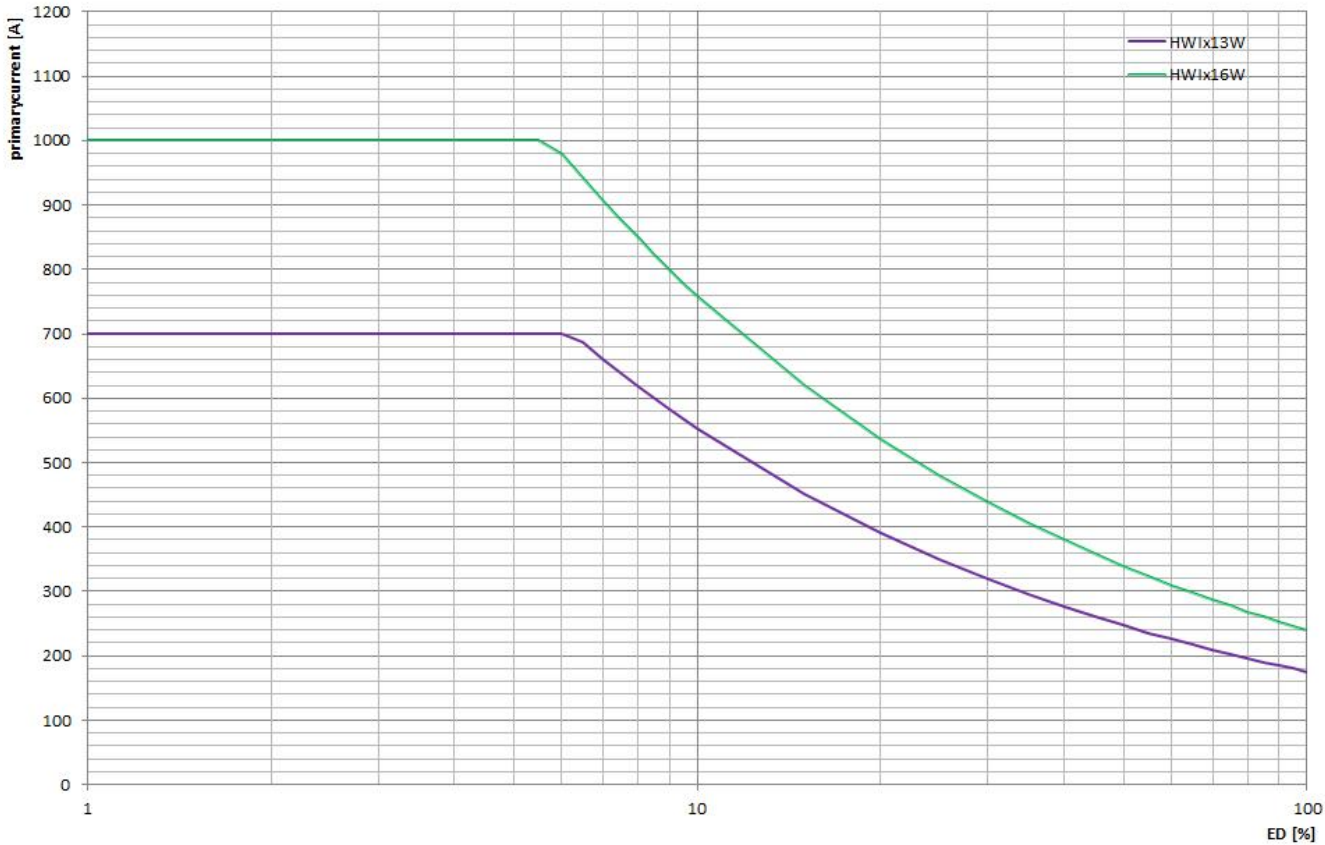
<sup>1)</sup> Peak current is specified.

<sup>2)</sup> The apparent power at 500 V mains voltage is specified.

<sup>3)</sup> Conductor current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application.

Limit value chart x13W[A] - x16W[A]

The current and power values specified are maximum allowable values.



## Inverter x24W - x36W

The current and power values specified are maximum allowable values.

Output classes	424	524	436	536
Cooling	W = water			
Power input 3 ph	400 / 440 V	500 V	400 / 440 V	500 V
Mains frequency	50 Hz / 60 Hz			
Working frequency	1000 Hz			
Maximum output current [10 ms]	1600 A		2400 A	
Output current at 20% ED <sup>1)</sup>	770 A		1050 A	
Output current at 100% ED <sup>1)</sup>	350 A		470 A	
Rated output voltage	500 / 550 V	600 V	500 / 550 V	600 V
Power at 20% ED) <sup>2)</sup>	385 kVA		525 kVA	
Primary continuous current <sup>3)</sup>	250 A		330 A	
Ambient temperature	+10°C to max. +40°C			
Relative humidity	Max. 90% and no condensation			

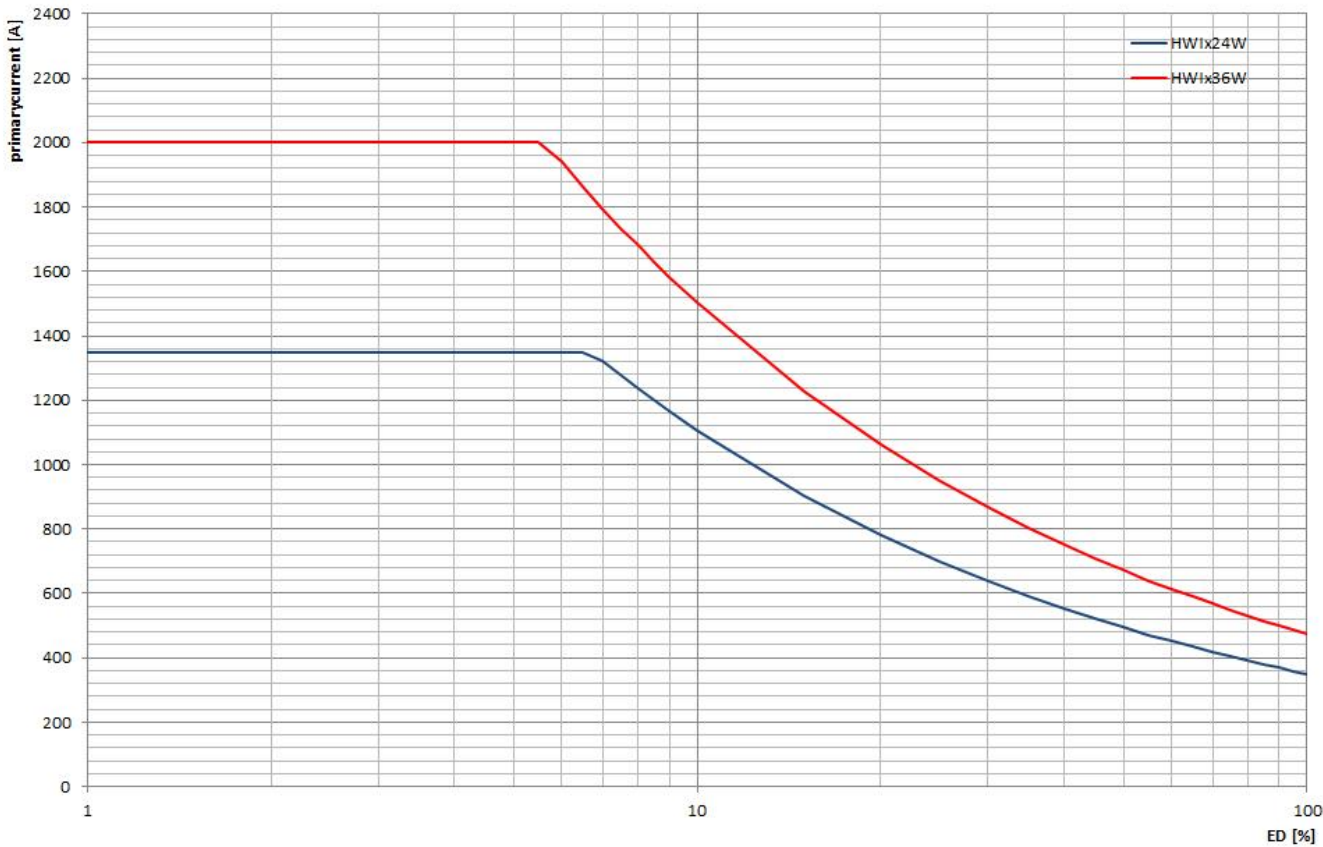
<sup>1)</sup> Peak current is specified.

<sup>2)</sup> The apparent power at 500 V mains voltage is specified.

<sup>3)</sup> Conductor current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application.

### Limit value chart x24W - x36W

The current and power values specified are maximum allowable values.



## Inverter2x24W-2x32W

The current and power values specified are maximum allowable values.

Output classes	2424	2524	2432	2532
Cooling	W – water			
Power input	400 /440 V	500V	400 /440 V	500V
Mains frequency	50 Hz / 60 Hz			
Working frequency	1000 Hz			
Maximum output current [10 ms]	1600 A		1990 A	
Output current at 20% ED <sup>1)</sup>	1000 A		1250 A	
Output current at 100% ED <sup>1)</sup>	450 A		570 A	
Rated output voltage	500 / 550 V			600V
Power at 20% ED <sup>2)</sup>	500 kVA		625 kVA	
Conductor current <sup>3)</sup>	315 A		420 A	
Ambient temperature	+10°C to max. +40°C			
Relative humidity	Max. 90% and no condensation			
Cooling water requirement	4 l/min			
Cooling water pressure	Max. 6 bar			
Cooling water connection	G ¼“ nipples with inner cone for hose connector according to DIN EN 560 (formerly DIN 8542) The cooling water connection is internally connected to the protective earthing conductor.			
Cooling water	Inlet temperature < 30°C, moisture condensate formation must be avoided Hydrogen ion concentration ph 7-9 Chlorides max. 20 mg/l, nitrates max. 10 mg/l Sulphates max. 100 mg/l Insoluble substances max. 250 mg/l Particle size max. 0.8 mm Total hardness D max. 10 German degrees (1 German degree = 1.25 English degrees = 1.05 US degrees = 1.8 French degrees)			

<sup>1)</sup> Peak current is specified.

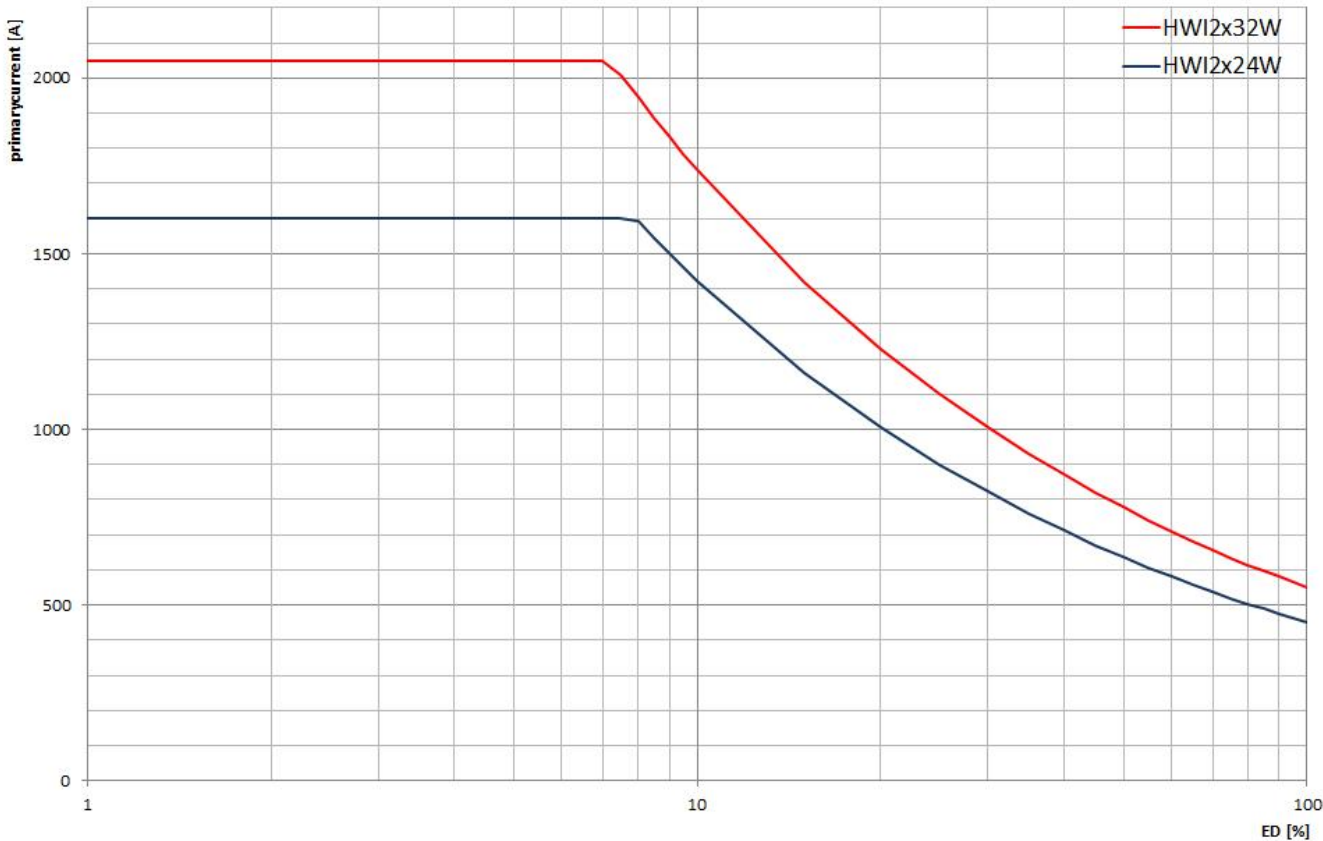
<sup>2)</sup> The apparent power at 500 V mains voltage is specified.

<sup>3)</sup> Conductor current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application.



### Limit value chart 2x24W-2x32W

The current and power values specified are maximum allowable values.



## Inverter3x40W-3x60W

The specified currents and powers are maximum permissible values.

Output classes	3440	3540	3445	3545	3460	3560
Cooling	W – water					
Power input	400 / 440 V	500V	400 / 440 V	500V	400 / 440 V	500V
Mains frequency	50 Hz / 60 Hz					
Working frequency	1000 Hz					
Maximum output current [10 ms]	3000 A		3500 A		3500 A	
Output current at 20% ED <sup>1)</sup>	1800 A		1900 A		2600 A	
Output current at 100% ED <sup>1)</sup>	800 A		850 A		1200 A	
Rated output voltage	500 / 550 V	600V	500 / 550 V	600V	500 / 550 V	600V
Power at 20% ED <sup>2)</sup>	900 kVA		950 kVA		1300 kVA	
Conductor current <sup>3)</sup>	550 A		600 A		850 A	
Ambient temperature	+10°C to max. +40°C					
Relative humidity	Max. 90% and no condensation					
Cooling water requirement	6 l/min				8 l/min	
Cooling water pressure	Max. 7 bar					
Cooling water connection	M16x1.5 bulkhead fittings with 24° inner cone (DIN 3861) for sealing head with union nut (hose fitting DIN 20078). The cooling water connection is internally connected to the protective earthing conductor.					
Cooling water	Inlet temperature < 30°C, moisture condensate formation must be avoided Hydrogen ion concentration pH 7-9 Chlorides max. 20 mg/l, nitrates max. 10 mg/l Sulphates max. 100 mg/, Insoluble substances max. 250 mg/l Particle size max. 0.8 mm Overall hardness D max. 10 German degrees (1 German degree = 1.25 English degrees = 1.05 US degrees = 1.8 French degrees)					

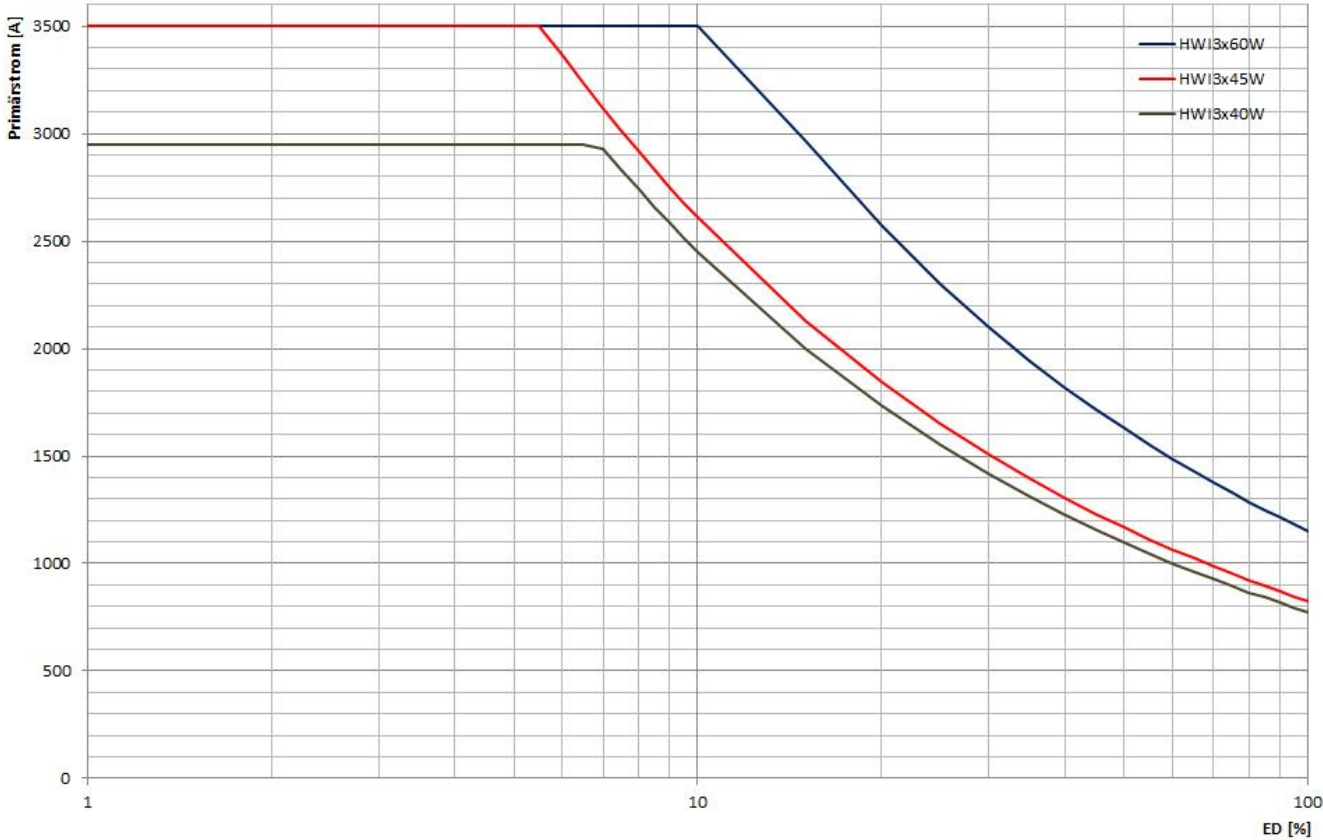
<sup>1)</sup> Peak current is specified.

<sup>2)</sup> The apparent power at 500 V mains voltage is specified.

<sup>3)</sup> Conductor current for dimensioning the fuses is specified. The currents may also be lower / higher depending on application.

Limit value chart 3x40W-3x60W

The current and power values specified are maximum allowable values.



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