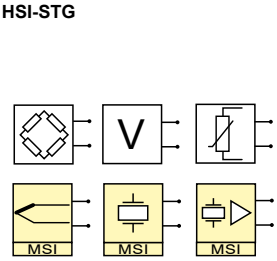
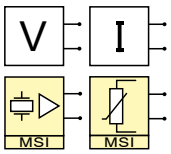
Selection Guide

HSI Series Modules

- *Single channel*
- *High bandwidth - for dynamic signals*
- *Isolation (all models)*
- *Analog signal output (±5 V)*
- *Single channel modularity*
- *For DEWETRON systems with built-in DAQ rack*
- *Pure signal conditioning solution in conjunction with DEWE-30 series racks*

Module	Input type	Ranges	TEDS	Bandwidth (BW), Filters (LP = lowpass, HP = highpass)	Isolation (ISO), Overvoltage protection (OP)
Universal measurement					
HSI-STG  	Strain gauge, bridge sensors	±0.1 to ±1000 mV/V (@ 5 VDC_{exc})	✓	BW: up to 2 MHz LP: 100 Hz to 2 MHz HP: 1 Hz	ISO: 350 V_{DC} OP: ±50 V_{DC}
	Piezoresistive bridge	±0.5 to 10000 mV/mA (@ 1 mA_{exc})			
	Voltage	±500 µV to ±10 V			
	Resistance	25 mΩ to 100 kΩ			
	Pt100, Pt200, Pt500, Pt1000, Pt2000	-200° C to 850° C			
	IEPE® via MSI-BR-ACC	±100 to ±10000 mV			
	Thermocouple via MSI-BR-TH-x	full range of TC type			
	Charge via MSI-BR-CH-50	up to 50000 pC			
	Voltage via MSI-BR-V-200	up to ±200 V			
High voltage measurement					
HSI-HV  	High voltage	±20 to ±1400 V	-	BW: 2 MHz LP: 100 Hz to 2 MHz	ISO: 1.8 kV_{RMS}
Voltage & current measurement					
HSI-LV  	Voltage	±10 mV to ±50 V	✓	BW: 2 MHz LP: 100 Hz to 2 MHz	ISO: up to 1 kV_{RMS} OP: 350 V_{DC}
	Current with external shunt	20 mA / 5 A			
	IEPE® via MSI-V-ACC	±10 mV to 5 V			
	Pt100, Pt200, Pt500, Pt1000, Pt2000 and resistance via MSI-V-RTD	-200° C to 1000° C and 8 to 4 kΩ			

HSI-STG — Isolated universal input module

- *Strain gauge, bridge sensors:* ±0.1 to ±1000 mV/V (@ 5 V_{DC} excitation)
- *Piezoresistive bridge:* ±0.5 to ±10000 mV/mA (@ 1 mA excitation)
- *Voltage input:* ±500 µV to ±10 V
- *RTD* Resistance Temperature Detector (Pt100 to Pt1000)
  9 resistance ranges (8 to 4000 Ω)
- *Resistance:* 25 mΩ to 100 kΩ
- *Isolation:* 350 V_{DC}
- *Signal connection:* 9-pin SUB-D socket

HSI-STG-D

Additional signal input using MSI

- *IEPE®* Constant current powered sensors (accelerometers, microphones); 12 ranges (±100 mV to 10 V); requires MSI-BR-ACC
- *THERMOCOUPLE* full range of TC type; requires MSI-BR-TH-x
- *CHARGE* Charge up to 50000 pC; requires MSI-BR-CH-50
- *VOLTAGE* up to ±200 V; requires MSI-BR-V-200

Module specifications

	HSI-STG
Gain	0.5 to 10 000; free programmable
Voltage input ranges Sensitivity @ 5 V_{DC} excitation	±0.5[3], ±1[3], ±2.5[3], ±5, ±10, ±25, ±50, ±100, ±250, ±500 mV, ±1 V, ±2V, ±5 V,±10 V[3] ±0.1[3], ±0.2[3], ±0.5[3], ±1, ±2, ±5, ±10, ±20, ±50, ±100, ±200, ±400, ±1000 mV/V
Resistance	25 mΩ to 100 kΩ
Input impedance	>100 MΩ (power off: 50 kΩ)
Input noise	7 nV * √Hz
Voltage input 1 year accuracy[1] Gain drift Offset drift linearity	±0.05 % of reading ± 0.02 % of range ±10 µV typical 10 ppm/°K max. 20 ppm/°K typical 0.3 µV/°K + 5 ppm of range/°K, max 2 µV/°K + 10 ppm of range typical 0.03 %
Input coupling	DC or AC (-3 dB @ 1 Hz); max. DC voltage when AC coupled: 35 V
Excitation voltage 1 year accuracy[1] Drift Current limit Protection	0, 0.25, 0.5, 1, 2.5, 5,10 and 12 V_{DC} software programmable (16 Bit DAC) ±0.03 % ±1 mV ±10 ppm/°K ±50 µV/°K 100 mA Continuous short to ground
Excitation current 1 year accuracy[1] Compliance voltage Output impedance	0.1, 0.2, 0.5, 1, 2, 5, 10 and 20 mA software programmable (16 Bit DAC) 0.1 mA to 5 mA: 0.05% ±0.5 µA typical 15 ppm/°C >5 mA to 60 mA: 0.3% ±20 µA typical 100 ppm/°C 12 V >1 MOhm
Supported sensors	4- or 6-wire full bridge 3- or 5-wire ½ bridge with internal completion (software programmable) 3- or 4-wire ¼ bridge with internal resistor for 120 and 350 Ohm (software programmable)[1] 4-wire full bridge with constant current excitation (piezoresistive bridge sensors) Potentiometric Resistance Resistance Temperature Detection with Software linearization: Pt100, Pt200, Pt500, Pt1000
Bridge resistance	80 Ω to 10 kΩ @ ≤ 5 V_{DC} excitation
Shunt calibration	Two internal shunt resistors 59.88 kOhm and 175 kOhm
Shunt and completion resistor accuracy	0.05 % ±15 ppm/°K
Automatic bridge balance	Input range 500 µV to 25 mV: ±400 % of Range >25 mV to 10 V : ±200% of Range, or limited by input range to maximum ±10 V
Bandwidth[2] (-3 dB)	5 mV to 5V input range: 2 MHz; 500 µV: 1 MHz; 1 mV: 1.5 MHz, 2.5 mV 1.9 Mhz, 10 V: 1 MHz
Filters (low pass)	100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz (±1.5 dB @ f_0)
Filter characteristics	100 Hz to 1 MHz: Butterworth or Bessel 40 dB/dec (2nd order; ±1.5 dB @ f_0) 2 MHz: Butterworth 60 dB/dec (3rd order; 0 to -3 dB @ 2 MHz)
Signal delay @ 2 MHz bandwidth	450 nsec

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Rise time @ 2 MHz bandwidth	≥ 200 nsec							
Typical THD	95 dB, 1 KHz input signal at 1 V range							
Typical SFDR and SNR	1 kHz bandwidth		10 kHz bandwidth		100 kHz bandwidth		1 MHz bandwidth	
	SFDR	SNR	SFDR	SNR	SFDR	SNR	SFDR	SNR
1 mV	80 dB	66 dB	80 dB	62 dB	80 dB	55 dB	47 dB	46 dB
100 mV	100 dB	82 dB	90 dB	78 dB	90 dB	71 dB	66 dB	60 dB
1000 mV	110 dB	100 dB	110 dB	97 dB	106 dB	91 dB	87 dB	79 dB
Typical CMRR	0.5mV to 1V range		2V to 10V range					
50Hz	160 dB		160 dB					
1kHz	126 dB		105 dB					
10kHz	104 dB		87 dB					
100kHz	87 dB		71 dB					
Isolation	±350 V_{DC} continuous (for input, excitation and TEDS interface)							
Common mode voltage	±350 V_{DC} input to housing							
Over voltage protection	±30 V_{DC} input (+) to input (-)							
ESD protection	IEC61000-4-2: ±8 kV air discharge, ±4 kV contact discharge							
Output voltage	±5 V							
Output resistance	10 Ω							
Output current	Max. 5 mA							
Output protection	Short to ground for 10 seconds							
RS-485 interface	Yes							
Special function	Integrated temperature sensor							
Supported TEDS chips	DS2406, DS2430A, DS2431, DS2432, DS2433							
MSI support	MSI-BR-TH-x, MSI-BR-ACC, MSI-BR-V-200, MSI-BR-CH-50							
Power supply voltage	±9 V_{DC} (±1 %)							
Power consumption	Typ. 1.5 W @ 350 Ohm, 2 W @ 120 Ohm (both full bridge @ 5 V_{DC} excitation) Max. 3 W (depending on sensor); overall current should not exceed DEWE-30-xx maximum power.							

[1] Conditions fo accuracy: module temperature is calibration temperature ±5 °C; humidity is 30 % to 90 % relative humidity.

[2] Please consider possible bandwidth limitation of further components in the measuring chain e.g. A/D card or signal conditioning mainframe.

[3] This range has limited full power bandwidth.

HSI-HV — Isolated high voltage module

- *Input ranges:* 7 ranges (±20 V to ±1400 V)
- *Bandwidth:* 2 MHz
- *Isolation:* 1.8 kV_{RMS} line to line
  1.4 kV_{RMS} line to ground
- *Input impedance:* 10 MΩ
- *Protection:* 4 kV burst, surge
- *Signal connection:* Banana sockets

HSI-HV

Module specifications

	HSI-HV							
Input ranges	±20 V[1], ±50 V[1], ±100 V, ±200 V, ±400 V, ±800 V, ±1400 V							
1 year accuracy[2]	Range	Signal frequency	Accuracy					
	20 V; 50 V	DC	±0.05 % of reading ±60 mV					
	100 V to 1400 V	DC	±0.05 % of reading ±0.05 % of range					
		0.1Hz to 500 Hz	±0.05 % of reading ±0.01 % of range					
		>500 Hz to 5 kHz	±0.1 % of reading ±0.05 % of range					
		>5 kHz to 50 kHz	±0.4 % of reading ±0.05 % of range					
		>50 kHz to 100 kHz	±(0.016*f) % of reading ±0.1 % of range					
		>100 kHz to 1 MHz	±(0.010*f) % of reading ±1 % of range					
		>1 MHz to 2 MHz	±(0.014*f) % of reading ±3 % of range					
			f = signal frequency in kHz					
Gain linearity	0.05 %							
Gain drift range	Typically 20 ppm/°C (max. 50 ppm/°C)							
Offset drift								
20 V to 100 V	typical 1.5 mV/°C of range		max. 4 mV/°C					
200 V to 1400 V	typical 5 ppm/°C		max. 20 ppm of range/°C					
Long term stability	100 ppm/sqrt (1000 hrs)							
Input resistance	10 MΩ || 2.2 pF							
-3 dB Bandwidth	2 MHz							
Signal delay @ full bandwidth	approx. 390 ns							
Filter selection	Push button or software							
Filter (lowpass)	100, 300, 1k, 3k, 10k, 30k, 100k, 300 kHz, 1 MHz, 2 MHz[3]							
Filter type	Bessel or Butterworth 40 dB/decade							
Filter characteristics								
100 Hz to 1 MHz	Butterworth or Bessel 40 dB/dec (2nd order; ±1.5 dB @ f_0)							
2 MHz	Butterworth 60 dB/dec (3rd order; 0 to -3 dB @ 2 MHz)							
Typical SFDR and SNR	10kHz bandwidth		100kHz bandwidth		1MHz bandwidth		2 MHz bandwidth	
	SFDR	SNR	SFDR	SNR	SFDR	SNR	SFDR	SNR
50 V	110 dB	91 dB	110 dB	82 dB	94 dB	76 dB	84 dB	73 dB
400 V	110 dB	95 dB	110 dB	92 dB	94 dB	82 dB	84 dB	77 dB
1400 V	110 dB	95 dB	110 dB	95 dB	94 dB	82 dB	84 dB	77 dB
Typical CMRR	>80 dB @ 50 Hz		60 dB @ 1 kHz					
	70 dB @ 400 Hz		48 dB @ 10 kHz					
Isolation voltage	Line to Ground 1.4 kVrms							
	Line to Line 1.8 kVrms							
Protection	CAT III 600							
	CAT IV 300							
Surge (1.2/50)	±4000 V							
Burst (5 kHz)	±4000 V							
Output voltage	±5 V							
Output resistance	10 Ohm							
Output current maximum	35 mA	CAUTION: do not exceed maximum output current!						
Power supply	±9 V_{DC} ± 1%							
Power consumption	1.2 W							
Power On default settings	Software programable							
Special functions	Integrated temperature sensor							
Programming interface	RS-485							

[1] 20 V and 50 V are auxiliary ranges and have a limited bandwidth.
20 V range typically 0.9 Mhz
50 V range typically 1.9 Mhz

[2] Conditions for accuracy: Module temperature is calibration temperature ±5 °C; humidity is 30 to 90 RH;
AC accuracy: the highest filter (2 Mhz) has to be activated. f = signal frequency in kHz.
for the 2 year accuracy multiply all % of range and % of reading values by 1.5.

[3] 2 MHz filter: exclusively Butterworth 60 dB/decade. Please consider possible bandwidth limitation of further components in the measuring chain, e.g. A/D cards or signal conditioning mainframe

HSI-LV — *Isolated low voltage module*

- *Voltage input:* *12 ranges (10 mV to 50 V)*
- *Current input:* *±20 mA using SE-CUR-SHUNT-1*
  ±5 A using SE-CUR-SHUNT-4 or -SHUNT-5
- *Bandwidth:* *2 MHz*

Additional signal input using MSI

- *IEPE®* *Constant current powered sensors (accelerometers,microphones); 12 ranges (10 mV to 5 V); requires MSI-V-ACC*
- *RTD* *Resistance Temperature Detector (Pt100 to Pt2000) 9 resistance ranges (8 to 4000 Ω); requires MSI-V-RTD*

Module specifications

	HSI-LV							
Input ranges	10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2.5 V, 5 V, 10 V, 25 V, 50 V							
Button selectable ranges	10 mV, 50 mV, 200 mV, 1 V, 5 V, 10 V, 50 V							
Rated input voltage	33 V_{RMS}, 46.7 V_{PEAK}, 70 V_{DC} according to EN-61010-1 and EN-61010-2-30							
1 year accuracy[1)]	Range		Signal frequency		Accuracy			
Bipolar	10 mV to 100 mV		DC		±0.02 % of reading ±60 µV			
	2.5 V		DC		±0.02 % of reading ±0.1 % of range			
	200 mV to 50 V		DC		±0.02 % of reading ±0.05 % of range			
	10 mV to 100 mV		0.1 Hz to 5 kHz >5 kHz to 50 kHz >50 kHz to 100 kHz >100 kHz to 1 MHz >1 MHz to 2 MHz		±0.1 % of reading ±30 µV ±0.4 % of reading ±30 µV ±(0.016*f) % of reading ±0.1 % of range ±(0.010*f) % of reading ±1 % of range ±(0.014*f) % of reading ±3 % of range			
	200 mV to 50 V		0.1 Hz to 500 Hz >500 Hz to 5 kHz >5 kHz to 50 kHz >50 kHz to 100 kHz >100 kHz to 1 MHz >1 MHz to 2 MHz		±0.05 % of reading ±0.01 % of range ±0.1 % of reading ±0.05 % of range ±0.4 % of reading ±0.05 % of range ±(0.016*f) % of reading ±0.1 % of range ±(0.010*f) % of reading ±1 % of range ±(0.014*f) % of reading ±3 % of range			
Unipolar	10 mV to 100 mV 200 mV to 50 V		DC DC		±0.02 % of reading ±60 µV ±0.02 % of reading ±0.08 % of range			
Input coupling	DC or AC software selectable (1.5 Hz standard, custom on request down to 0.01 Hz)							
Gain linearity	Typically 0.01 %; max. 0.04 % of full scale							
Gain drift range	Typically 10 ppm/°C (max. 30 ppm/°C)							
Offset drift	10 mV to 200 mV: 500 mV to 50 V:		Typically 3 µV/°C Typically 10 ppm of range/°C					
Long term stability	100 ppm/sqrt (1000 hrs)							
Input resistance	1 MOhm							
Bandwidth (-3 dB)	2 MHz							
Signal delay @ full bandwidth	approx. 405 ns							
Filter selection	Push button or software							
Filter	100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 2 MHz[2)]							
Filter type	Bessel or Butterworth 40 dB/dec							
Filter characteristics 100 Hz to 1 MHz 2 MHz	 Butterworth or Bessel 40 dB/dec (2nd order; ±1.5 dB @ f_0) Butterworth 60 dB/dec (3rd order; 0 to -3 dB @ 2 MHz)							
Typical SFDR and SNR:	10 kHz bandwidth		100 kHz bandwidth		1 MHz bandwidth		2 MHz bandwidth	
	SFDR	SNR	SFDR	SNR	SFDR	SNR	SFDR	SNR
20 mV	88 dB	78 dB	88 dB	71 dB	77 dB	60 dB	76 dB	56 dB
1 V	110 dB	98 dB	110 dB	95 dB	93 dB	82 dB	84 dB	75 dB
50 V	110 dB	98 dB	110 dB	95 dB	94 dB	82 dB	85 dB	75 dB
Typical CMRR	10 mV to 1 V range:		2.5 V to 50 V range:					
50 Hz	130 dB		100 dB					
1 kHz	120 dB		60 dB					
10 kHz	95 dB		40 dB					
100 kHz	75 dB		20 dB					

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Input overvoltage protection	350 V_{DC}
Isolation voltage	1 kV_{RMS} [3]
Sensor supply	±9 V (±1 %), 12 V (±5 %), 200 mA resettable fuse protected[4]
Output voltage	±5 V
Output resistance	10 Ohm
Maximum output current	5 mA
Output protection	Short to ground for 10 sec.
Power On default settings	Software programable
Power supply	±9 V_{DC} ±1 %
Power consumption	1.1 W without sensor supply
Special functions	Integrated temperature sensor
RS-485 interface	Yes
TEDS	Hardware support for TEDS (Transducer Electronic Data Sheet)
Supported TEDS chips	DS2406, DS2430A, DS2432, DS2433, DS2431
Supported MSI	MSI-V-ACC, MSI-V-RTD

[1] Conditions for accuracy: Module temperature is calibration temperature ±5 °C; humidity is 30 to 90 RH.
AC accuracy: the highest filter (2 MHz) has to be activated. f = signal frequency in kHz.
For the 2 year accuracy multiply all % of range and % of reading values by 1.5.

[2] 2 MHz filter: exclusively for Butterworth 60 dB/decade - refer to filter specifications. Please consider possible bandwidth limitation of further components in the measuring chain, e.g. A/D card or signal conditioning mainframe.

[3] Although the rated input voltage is 33 V_{RMS}, 46.7 V_{PEAK} or 70 V_{DC} according to EN-61010-1 and EN-61010-2-30, the galvanic isolation has been tested with 1 kV_{RMS} for 1 min.

[4] Overall current should not exceed DEWE-30-xx maximum power.