Manual

for Operation

VDS 200Q series

Voltage Drop Simulator pulses 2b, 4

VDS 200Q25.2, VDS 200Q50.2, VDS 200Q100.2, VDS 200Q150.2, VDS 200Q200.2

Testing of electronic modules in 12V/24V or 48V supply systems.

The VDS 200Q is four-quadrant linear power amplifier with a very low source impedance. It simulates the battery power supply of a vehicle and complex power supply distortions in the power range up to 12 kW. Many different waveforms are integrated as standard such as pulse 2b required by ISO 7637 and the starting profile from ISO 16750 as well as requirements from many manufacturers' standards like LV 124 and LV 148.

- ISO 7637
- ISO 16750
- SAE J1113
- Manufacturer spec LV 124, LV 148, GM, Ford, Chrysler, BMW, VW, PSA, Renault, Fiat ....

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Contents

1. Model Overview

1.1. VDS 200Q Models

Standard models

Model	voltage	current	Max. Inrush current	Sinus f max
VDS 200Q25.2	-20 to 80 V	Imax = ±25 A	75A for 200 ms	250 kHz
VDS 200Q50.2	-20 to 80 V	Imax = ±50 A	50A for 200 ms	250 kHz
VDS 200Q100.2	-20 to 80 V	Imax = ±100 A	200A for 200 ms	250 kHz
VDS 200Q150.2	-20 to 80 V	Imax = ±150 A	450A for 200 ms	250 kHz
VDS 200Q200.2	-20 to 80 V	Imax = ±200 A	600A for 200 ms	250 kHz

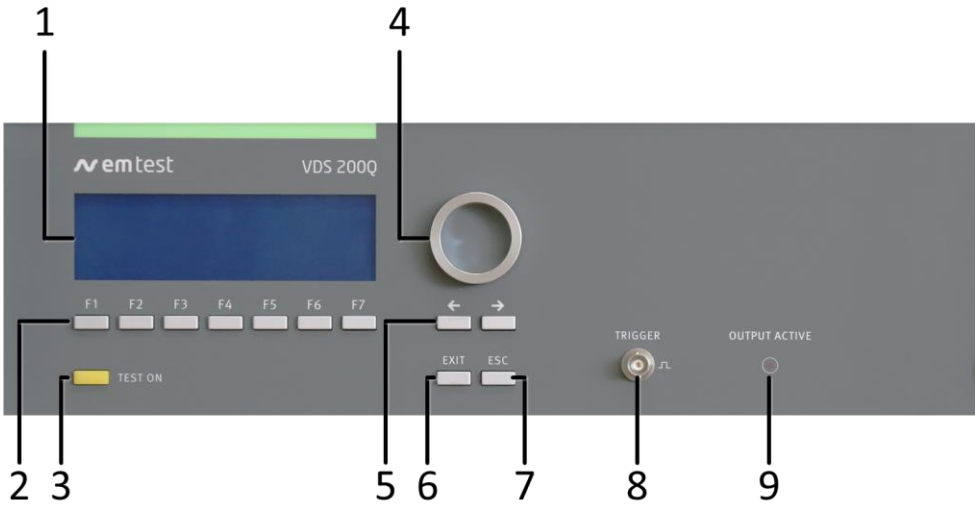
VDS 200Q200.2

VDS 200Q150.2

VDS 200Q100.2

2. Operating Functions

2.1. Front view



1 Display
2 Function keys "F1..F7"
3 "TEST ON"
4 Knob (Inc/Dec)
5 Cursor keys "←" and "→"
6 EXIT
7 ESC
8 BNC CRO Trigger (for oscilloscope)
9 OUTPUT ACTIVE LED

1 Display
All functions and parameters are displayed (8 lines with max. 40 characters).

2 Function keys "F1 .. F7"
Parameters and functions, displayed in the lowest line, can be selected with the related function key.

3 Test On
By pressing the key "TEST ON" the test procedure is initiated with the preselected parameters. The yellow button is illuminated and indicates the Test ON status. After “Test OFF” or when no test is started, the output voltage and the current will be set to zero.

4 Knob (Inc / Dec)
The knob increments or decrements test parameters with a numeric value or selects from a list of parameters.

5 Cursor keys
Parameters and functions can be changed on-line. The selection of these parameters is realized with the cursor moving to the left or to the right.

6 Exit
Pressing the "EXIT" function will return to the previous menu. This is only possible if no test routine is running.

7 ESC
When pressing the ESC button the user moves back one page in the menu.

8 BNC CRO Trigger
At the BNC connector CRO TRIGGER a signal is available to trigger an oscilloscope.

9 OUTPUT ACTIVE LED
Output to the DUT or other generators.

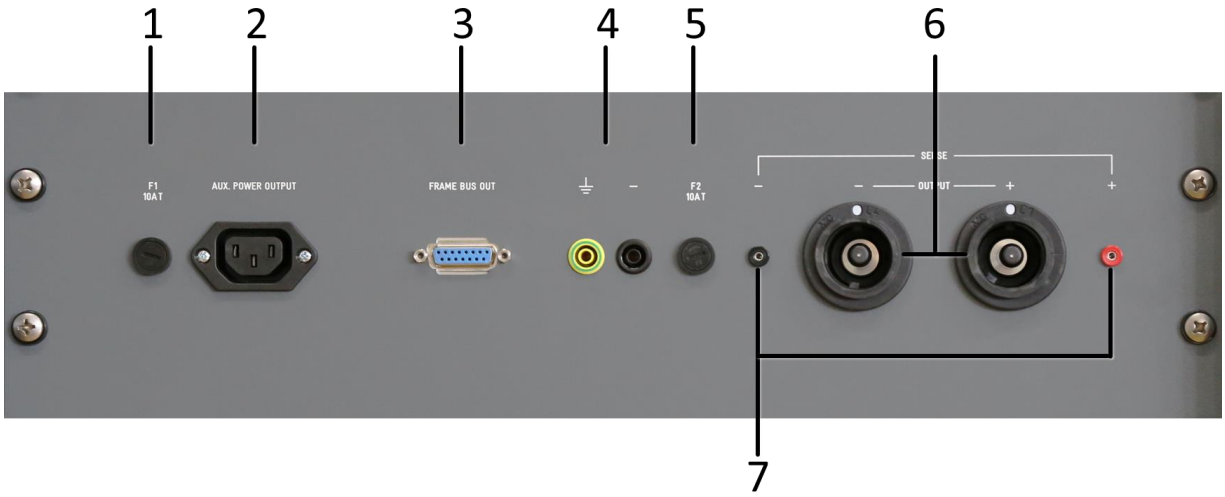
Additionally, on the front of the VDS 200Q models, there are the following elements:

Power ON/OFF Switch
Used to power on and off the system. At start, a synchronization and boot process will occur. After a few moments, the system is ready to be used.

CAUTION:
Do not misuse the power on/off switch.
The VDS 200Q contains multiple controllers and signal generators that must be synchronized at startup.

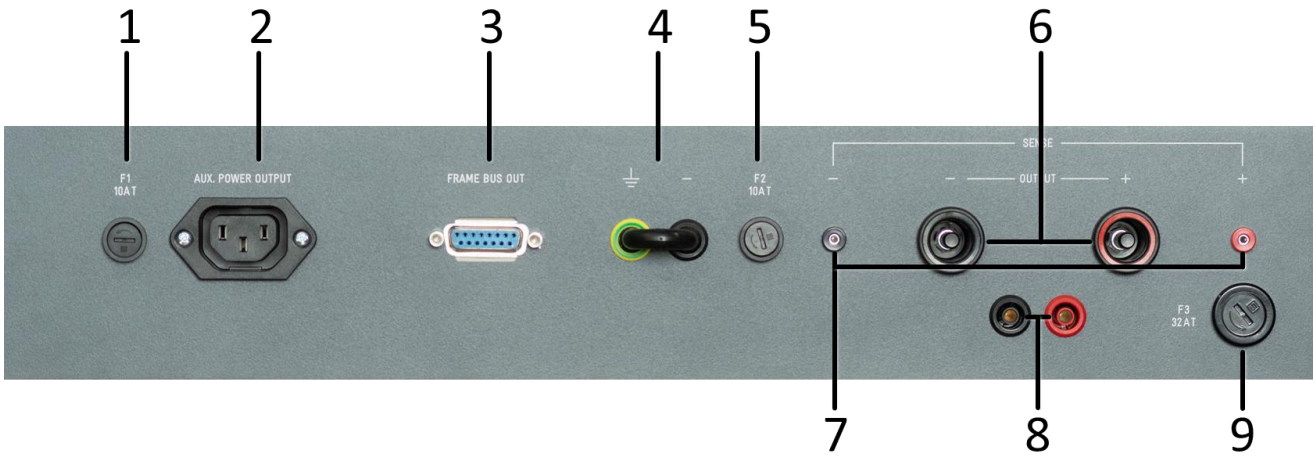
For best results, please allow at least five seconds between switching off and back on the generator.

Output Connectors and Interconnects VDS 200Q150.2 and VDS 200Q200.2



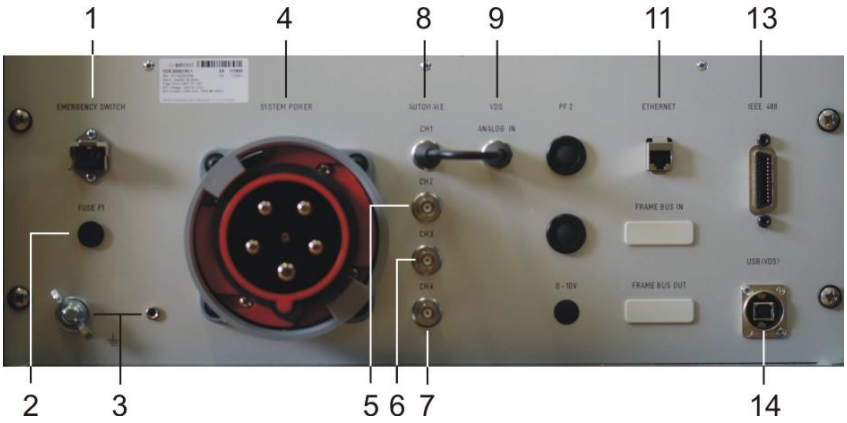
1 Fuse 10 A (5x20 mm) for the PFM mains
2 Mains output to external PFM 200N200
3 Frame Bus out to PFM 200N200
4 Ground connector Minus to GND to minimize noise, when an isolated output is not needed
5 Fuse 10 A (5x20 mm) against excess ground leakage current
6 DC out to DUT or PFM 200N200
7 Sense input

Output Connectors and Interconnects VDS 200Q100.2



1 Fuse 10 A (5x20 mm) for the PFM mains
2 Mains output to external PFM 200N100
3 Frame Bus out to PFM 200N100
4 Ground connector Minus to GND to minimize noise, when an isolated output is not needed
5 Fuse 10 A (5x20 mm) against excess ground leakage current
6 DC out to DUT
7 Sense input
8 Measurement or
Low-current output (32A max.)
9 Fuse 32 A for Low-current output

2.2. **Rear view VDS 200Qxx.2**



1 Emergency Switch
2 Fuse or (additional Mains on some models)
3 Earth Connections
4 Mains Input 1-ph or 3-ph
5-7 Optional AutoWave Out (N/C)
8 AutoWave Out to VDS In
9 VDS Analog In
10 Optional Framebus In
11 Ethernet (to AutoWave)
12 Framebus Out
13 IEEE 488.1
14 USB (to VDS)

1 Emergency Switch
Used to connect the emergency lockout switch.

2 Fuse
See 5.5 General, and 4.2 Fuses

Note: On the 208V models, this is replaced by an additional mains connector for countries where 100-120V mains is the norm. In this case, be sure to connect this to mains.

3 Reference earth connection
During immunity tests, it may be useful to connect the simulator with reference earth plane of the test set-up. For complete rack installations, all different test generators shall be grounded at this point.

4 Mains input
This connector depends on the VDS model

5-7 Optional AutoWave Outputs
Can be used to connect the AutoWave with additional sources

8 AutoWave CH1 Output
Not present on some units when connected internally

NOTE: If equipped with a CH1 output, the supplied BNC bridge must be connected to Analog In to the VDS

9 Analog In to VDS
Connection to AutoWave or an external arbitrary waveform generator if needed.

10 Optional Framebus In
The framebus is usually taken from the AutoWave

11 Ethernet connection pass-through for AutoWave (if equipped)

12 Framebus Out
Be sure to use the supplied Framebus terminator 101732

13 IEEE 488 // GPIB
IEEE 488 interface with IEEE connector.

14 USB interface
USB interface “USB B” connector. For data transfer a USB interface is available. The internal RS 232 interface is converted to USB standard. Therefore, the user must set the same Baudrate in the device and control software.
Note: USB interface is for controlling the VDS 200Q in stand-alone configuration. See the PFM 200N200 and AutoWave manuals if alternative configurations will be used. AutoWave, doesn’t support USB communications.

2.3. Safety with voltage setting

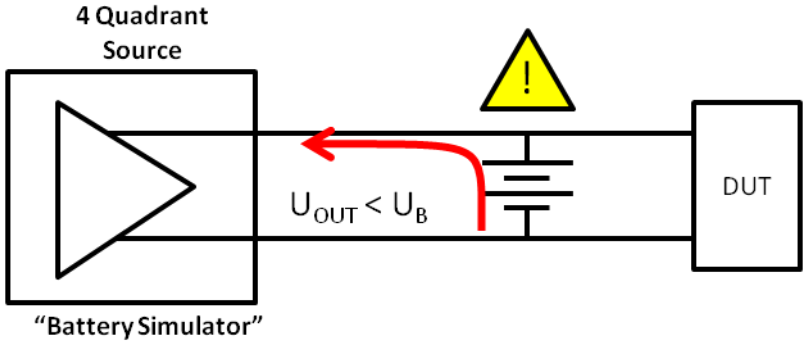
To ensure a safe operation of the DUT (Device Under Test) some restrictions in the operation of the instrument are built in. These restrictions are explained within this paragraph.

CAUTION:
The VDS 200Q series, as well as most linear power amplifiers will create spikes at start and stop. These are limited to 15V normally, but inductive loads can generate high voltages. Do not touch any conducted parts of the system and be sure to remove the DUT during power up and shut down or damage may occur.

Do not use the VDS 200Q with a parallel battery.

A four-quadrant source, like the VDS 200Q can supply both positive and negative voltage as well as positive or negative current in any combination. It can also sink current that may be supplied from external sources. Often, using a classic 'source' (power supply or 1 - 2 quadrant source) the user felt the need to buffer the voltage in order to get inrush or to properly simulate the impedance of the battery in the car. This, of course, can no longer be controlled as the source simply becomes a charger for the battery.

However, when using a four-quadrant source like the VDS 200Q and the source's voltage is set lower than the battery, the battery can discharge through the source.



This can result in a dangerous condition, not only for the four-quadrant source, but also because you've effectively short-circuited the battery when setting the voltage to zero (or switching the four-quadrant source off!). Remember that all sources must have a source impedance of <10 mOhm according to ISO 7637.

Finally, by shorting (or overcharging) the battery, the battery can actually overheat, crack (releasing acid!) or even explode due to the release of hydrogen.

CAUTION:
Do not use a parallel battery with the VDS 200Q or a dangerous condition can occur by exceeding the current of the VDS 200Q, and/or overheating the battery.

The VDS 200Q basically is divided into 2 different operation modes, which includes their individual test routines and supply voltage setting. The different modes can be listed as follows:

DC Source
Within this mode the VDS 200Q is used as a simple DC power source in the range of up to 80V; and an integrated current limiter.

Arbitrary Waveform Simulator
Within this mode the VDS 200Q generates arbitrary waveforms and signals which are specified in different standards, such as pulse 4 of ISO 7637.

All these different test modes are changing generally the voltage supply setting of the generator in a different way. This would mean a certain risk for the operator to burn out the connected DUT by higher DC supply voltages as intended. Therefore it is decided to clearly separate the two test modes by the following structure listed:

Analogue input +10/-10V

The amplifier can be controlled by an external signal generator. The operator therefore shall select the User Test Routines of the VDS 200Q part and start the menu Extern. The amplifier is then able to be remotely controlled.

The input signal range is +10 to -10V in the frequency range of 0-250kHz. The output power (EUT test supply) is capable of 0-40V or 0-80V and a nominal current depending on setting. For example, in the normal (8x) gain setting, a 2V input signal would result in 16V out. Please note, the 3dB guaranteed bandwidth of 250 kHz is not guaranteed when controlling the source with the BNC analog input. Typical bandwidth when using an external control signal is 150 kHz.

1. DC source

When entering the Arbitrary Wave test mode the dc output voltage of the VDS 200Q is automatically set to the nominal voltage of the DUT. The actual nominal voltage can be defined in the service menu under "Set-up".
When starting the related test routines the output voltage will be generated as per the setting shown up in the display for each individual test routine.

- The operator can accept this setting and start the test immediately.
- The operator can first change the parameters and than start the test.

When leaving the test mode DC source the output voltage is automatically reset to the nominal supply voltage of the DUT. The previous voltage setting will be stored in the test file.

2. Arbitrary Wave Simulator

When selecting the Arbitrary Wave mode, the output voltage will be set automatically to the nominal voltage of the DUT. The actual nominal voltage can be defined in the service menu under "Set-up".
When starting the related test routines, the output voltage will be generated as per the setting shown up in the display for each individual test routine.

- The operator can accept this setting and start the test immediately.
- The operator can first change the parameters and then start the test.

When leaving the test mode Arbitrary Wave Simulator, the output voltage is automatically reset to 0V. The previous voltage test parameters will be stored and can be used for the next test.

The consequence of the structure is that between the different test modes

the DUT supply is automatically switched off.

Be sure to select the appropriate bandwidth (Capacitive, Standard, High Freq.) in the Service menu appropriate for the necessary test frequency.

While the full voltage and frequency can be programmed, bandwidth is typically measured at the -3dB point. Therefore, please keep in mind that there will be some attenuation at the maximum frequencies of each range that may have to be compensated for.

3. Operation

3.1. Description of the menus

The simulator VDS 200Q is operated by an easy menu control system. Seven function keys are available to select parameters and functions. All functions are indicated on the display; max. 8 lines and 40 characters.

The selected parameter is blinking and can be changed by turning the knob (incr./decr.).

←→ : The digit to be changed can be selected with the cursor (←→).

- Set values are directly indicated on the screen.
- Status on the bottom lines shows the desired status after pressing the function key.

ESC : ESC will take you back to the previous level in the menu and set the displayed values. The latest settings are stored automatically and will be recalled when the menu is selected again.

EXIT : The firmware will reset to the main screen.

AMETEK CTS
VDS 200Q100.2 Waveforms
Voltage Drop Simulator

V 1.00.00
Int. V1.00.00 SWN: 001234

The serial number and the version number SWN are used for traceability reasons. These numbers are listed in the factory test reports and calibration certificates. These numbers also are listed within the test reports generated by the iso.control software

Start-up display example VDS 200Q200.2

3.2. Main Menu

MAIN MENU

F1 : Source Mode
F2 : Wave Simulator

F6 : Source Settings
F7 : Service

F1 F2 F3 F4 F5 F6 F7

F1 Source Mode
A mode that allows the user to set immediate voltage for quick tests with a DUT.

F2 Wave Simulator
In this mode, the internal signal generator is used to generate arbitrary waveforms as required in different standards.
The operator can use the generator in this mode as a,
- DC power supply source,
- powerful power arbitrary wave generator with integrated test routines
- or simply as a battery simulator

The amplifier can be remote controlled by any external arbitrary generator. External generators shall be connected at the rear part of the equipment. Any waveform can be generated up to the upper bandwidth of the unit.

F6 Source Settings
Set-up, self-test, source settings and addresses of AMETEK CTS can be selected and displayed.

F7 Service

Set-up, self-test, source settings and addresses of AMETEK CTS can be selected and displayed.

3.2.1. ISO 7637

3.2.1.1. Pulse 4 voltage drop

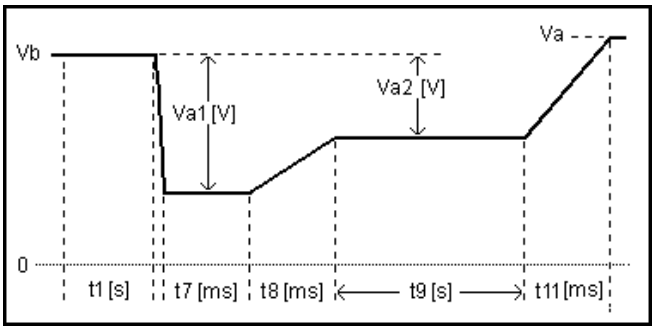
This pulse simulates supply voltage reduction caused by energizing the starter-motor circuits of internal combustion engines, excluding spikes associated with starting.

tf [Vb-Va1] < 5ms

Limits depends VDS voltage range

Input restrictions

0.0 V <= Vb + Va1 <= 30.0V (60.0V)
0.0 V <= Vb + Va2 <= 30.0V (60.0V)



Parameters:

Vb	0.0V	-	30.0V (60.0V)
Va1	- 30.0V (- 60.0V)	-	30.0V (+ 60.0V)
Va2	- 30.0V (- 60.0V)	-	30.0V (+ 60.0V)
t1	0.1s	-	99.9s
t7	5ms	-	999ms
t8	5ms	-	999ms
t9	0.1s	-	99.9s
t11	5ms	-	999ms
Va	0.0V	-	30.0V (+ 60.0V)
I	1A	-	(Imax)
tri	Auto / Manual		

3.2.1.2. Pulse 2b

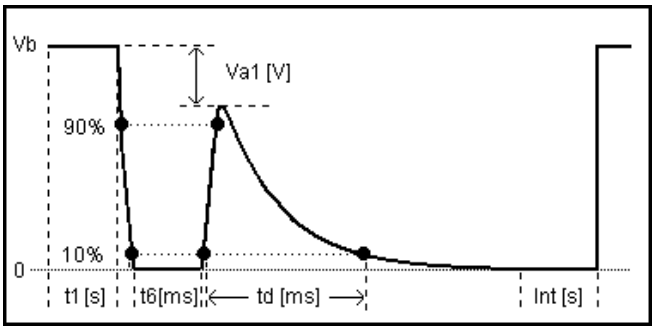
This pulse simulates transients from DC motors acting as generators after ignition is switched off.

tr, tf (10/90%) =1ms ± 50%

Limits depends VDS voltage range

Input restrictions

Va1 ≤ 0.0V
0.0 V ≤ Vb + Va1 ≤ 30.0V (60.0V)



Parameters:

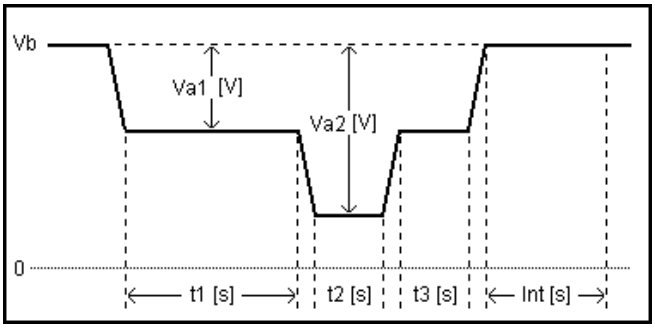
Vb	0.0V	-	30.0V (60.0V)
Va1	- 30.0V (- 60.0V)	-	0.0V
t1	0.1s	-	99.9s
t6	1ms	-	999ms
td	5ms	-	9999ms
int	0.1s	-	99.9s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

3.2.2. ISO 16750-2 WD 03/2000-2

3.2.2.1. Short voltage drop

This test is to simulate the effect of a classical fuse actuation in another circuit.

tr, tf = < 10ms



Limits depends VDS voltage range

Input restrictions

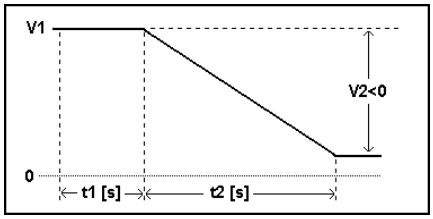
0.0 V ≤ Vb + Va1 ≤ 30.0V (60.0V)
0.0 V ≤ Vb + Va2 ≤ 30.0V (60.0V)

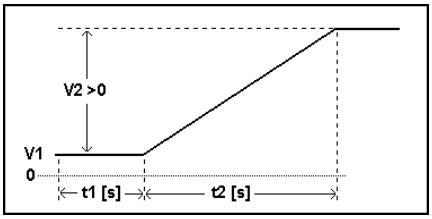
Parameters:

Vb	0.0V	-	30.0V (60.0V)
Va1	- 30.0V (- 60.0V)	-	30.0V (60.0V)
Va2	- 30.0V (- 60.0V)	-	30.0V (60.0V)
t1	0.1s	-	99.9s
t2	0.1s	-	99.9s
t3	0.1s	-	99.9s
int	0.1s	-	99.9s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

3.2.2.2. Slow decrease / increase

This test is to simulate a gradual discharge and recharge of the battery.





Parameters:

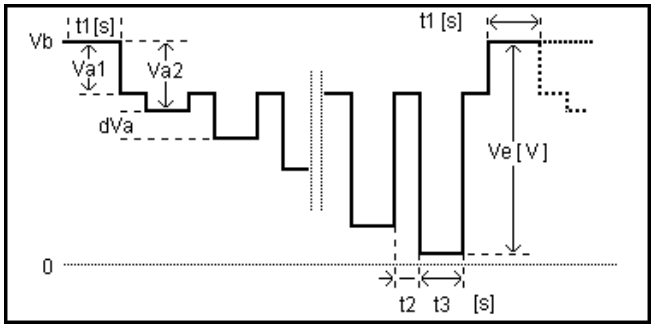
V1	0.0V	-	30.0V (60.0V)
V2	- 30.0V (- 60.0V)	-	30.0V (60.0V)
t1	0.1s	-	99.9s
t2	0.1s	-	9999.9s
I	1A	-	(Imax)

Remarks:

WD 03/2000-2 Voltage change rate = (3 ± 0.1) V per minute
ISO 16750-2 Voltage change rate = (0.5 ± 0.1) V per minute

3.2.2.3. Supply voltage profile

This test is to determine the reset behavior of the device under Test at different voltage drops. This test is applicable to equipment with reset function.



Parameters:

Vb	0.0V	-	30.0V (60.0V)
Va1	- 30.0V (- 60.0V)	-	30.0V (60.0V)
Va2	- 29.9V (- 59.9V)	-	30.0V (60.0V)
Ve	- 30.0V (- 60.0V)	-	30.0V (60.0V)
dVa	- 30.0V (- 60.0V)	-	30.0V (60.0V)
t1	0.1s	-	99.9s
t2	0.1s	-	99.9s
t3	0.1s	-	99.9s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

3.2.2.4. Pulse 'Starting profile'

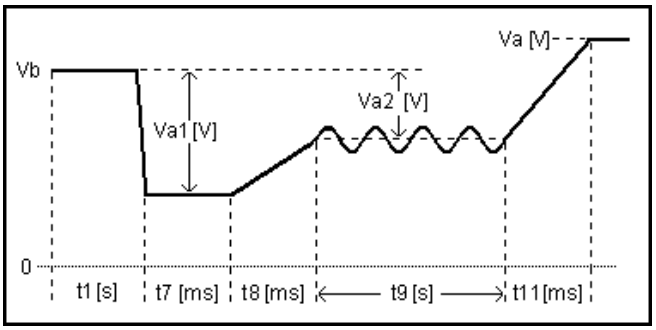
This test simulates a motor startup including a possible ripple.

tr, tf = < 10ms
Ripple = 2Hz

Limits depends VDS voltage range

Input restrictions

0.0 V ≤ Vb + Va1 ≤ 30.0V (60.0V)
0.0 V ≤ Vb + Va2 ≤ 30.0V (60.0V)



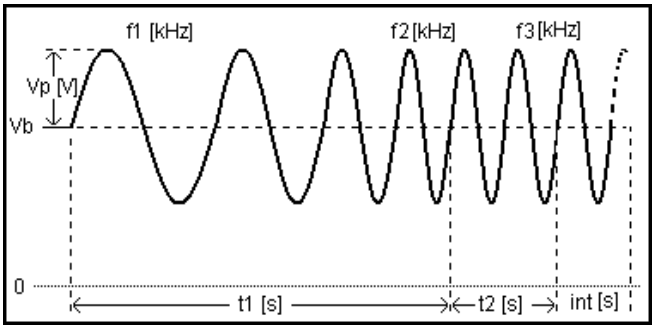
Parameters:

Vb	0.0V	-	30.0V (60.0V)
Va1	- 30.0V (- 60.0V)	-	30.0V (60.0V)
Va2	- 30.0V (- 60.0V)	-	30.0V (60.0V)
t1	0.1s	-	999ms
t7	5ms	-	999ms
t8	5ms	-	999ms
t9	0.5s	-	99.5s
t11	5ms	-	999ms
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

3.2.2.5. Sinus Sweep

This test simulates a residual a.c. on the dc supply

During Int f3 is applied.



Limitations

Vb + Vp <= 30.0V (60.0V)
Vb - Vp >= 0.0V

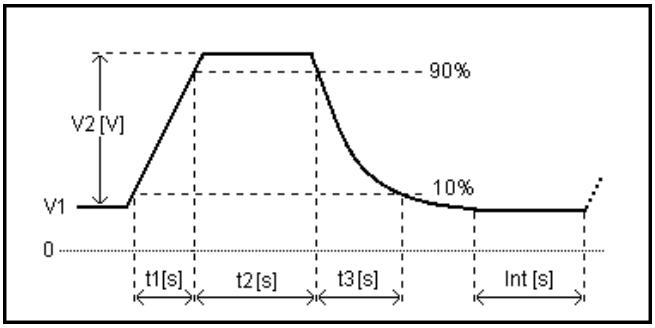
Parameters:

Vb	0.0V	-	30.0V (60.0V)
Vp	0.0V	-	0.1 - 30.0V[1)]
f1	0.001Hz	-	150.000kHz[2)]
f2	0.001Hz	-	150.000kHz[2)]
f3	0.001Hz	-	150.000kHz[2)]
t1	0.1s	-	999.9s
t2	0.1s	-	999.9s
int	0s	-	999s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

1) VDS 200Qnn.1 models: 250kHz; VDS 200Q10, 180kHz
2) VDS 200Q10: 0.1 - 60V

3.2.2.6. Overvoltage Vmax

This test simulates a high energy load dump pulse.



Limits depends VDS voltage range

Input restrictions

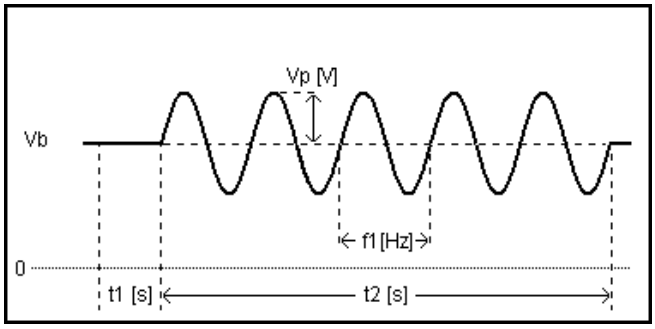
0.0 V ≤ V1 + V2 ≤ 30.0V (60.0V)

Parameters:

V1	0.0V	-	30.0V (60.0V)
V2	0.0V	-	30.0V (60.0V)
t1	0.01s	-	999.99 s
t2	0.01s	-	999.99 s
t3	0.01s	-	999.99 s
int	0.1s	-	99.9s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

3.2.3. Functions

3.2.3.1. Sine wave



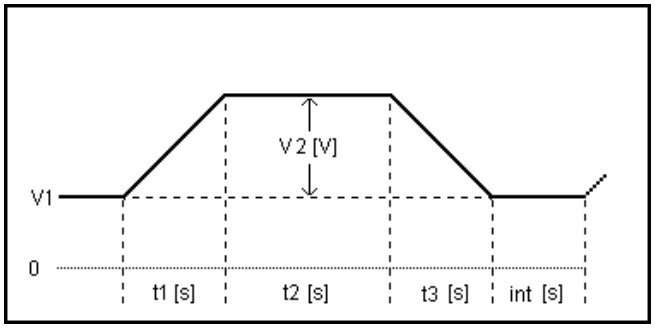
Limitations
Vb + Vp <= 30.0V (60.0V)
Vb - Vp >= 0.0V

Parameters:

Vb	0.0V	-	30.0V (60.0V)	
Vp	0.1V	-	30V[1)]	
t1	0.1s	-	99.9s	
f1	0.001kHz	-	250.00kHz	f< 100Hz ± 1.2Hz
t2	1.0s	-	999.9s	
n	1	-	30’000 / endl.	
I	1.0A	-	(Imax)	

Be sure to select the appropriate bandwidth in the Service menu appropriate for the necessary test frequency.

3.2.3.2. Jump Start



Limitations

V1 + V2	<=	30.0V (60.0V)
V1 + V2	>=	0.0V

Parameters:

V1	0.0V	-	30.0V (60.0V)
V2	- 30.0V (- 60.0V)	-	30.0V (60.0V)
t1	0.01s	-	999.99s
t2	0.01s	-	999.99s
t3	0.01s	-	999.99s
int	0.1s	-	99.9s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

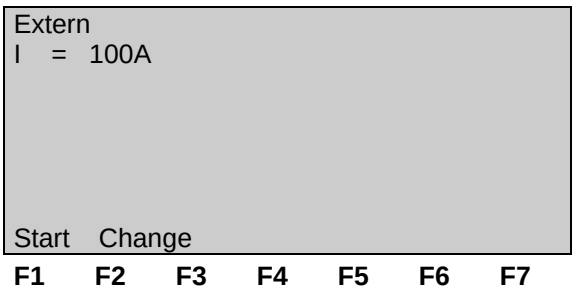
3.2.3.3. VDS Externally via the analog input

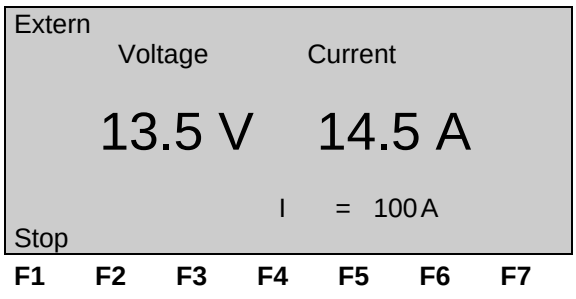
The power amplifier can be driven by an external control voltage (-10 to 10V), e.g. from an external waveform generator.

For this purpose the operator must select **VDS Extern** by pressing the related function key. The Extern mode is displayed and the unit can only be operated via the coaxial BNC input **ANALOG IN** at the rear part.

Parameters:

Input voltage at BNC input :-10...10V dc

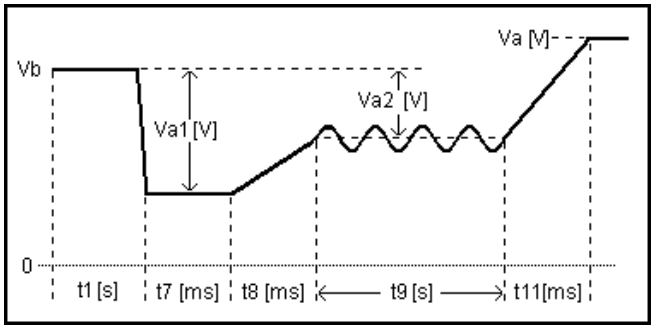




Note: The measured values are for indication only. Low current values are indicated with the value “LOW”.

3.2.3.4. Pulse 4 (GM 9105 P)

In addition to the ISO pulse 4 a 5Hz ripple of 1Vp-p is superimposed during t9 to Va.



tr, tf = < 10ms

Input restrictions

0.0 V ≤ Vb + Va1 ≤ 30.0V (60.0V)
0.0 V ≤ Vb + Va2 ≤ 30.0V (60.0V)

Parameters:

Vb	0.0V	-	30.0V (60.0V)
Va1	- 30.0V (- 60.0V)	-	30.0V (60.0V)
Va2	- 30.0V (- 60.0V)	-	30.0V (60.0V)
t1	0.1s	-	99.9s
t7	5ms	-	999ms
t8	5ms	-	999ms
t9	0.4s	-	99.8s
t11	5ms	-	999ms
tri	Auto / Manual		
I	1A	-	(Imax)

3.3. Service

All service functions are indicated on the display.

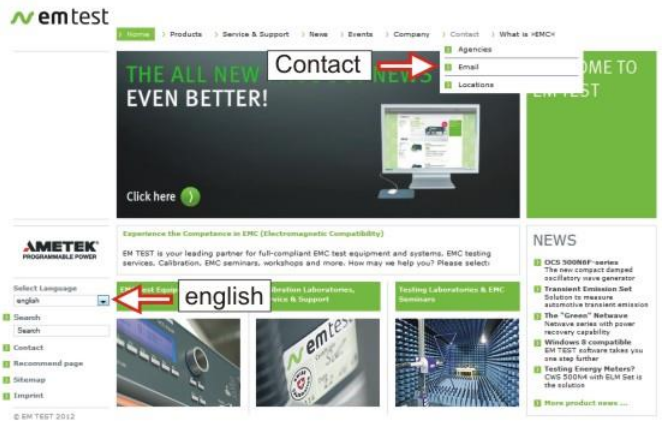
SERVICE
F1 : Addresses F2 : Selftest F3 : Setup
F5 : Set Voltage F6 : Source Setting

F1 F2 F3 F4 F5 F6 F7

Addresses

The addresses of the AMETEK CTS GmbH and the AMETEK CTS GmbH in Germany are shown.
The addresses of all AMETEK CTS sales agencies are listed on the web site of EM TEST under:

www.emtest.com



Selftest

The operator can initialize a self test procedure to check the operation of the instrument. The software will clearly explain the selftest procedure.

Set-up

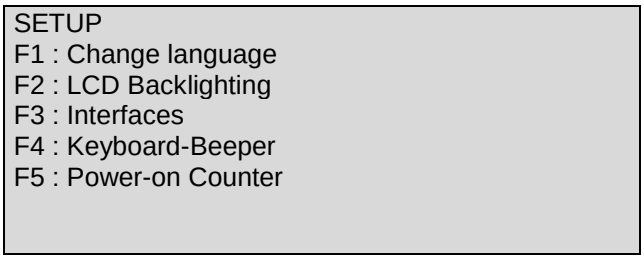
The operator can change the simulator setting as explained on the next chapter.

Source Settings

The source settings menu contains features that are specific to the VDS 200Q series as explained in the next chapter.

3.4. Setup

This menu helps the user to define the configuration of the VDS 200.



F1 Change language
The user can chose between two languages, German and English.

F2 LCD backlighting
With the use of F2 the backlighting can be switched ON or OFF. Additionally the AUTO-OFF function can be programmed to switch off the backlighting after a defined time when the equipment has not been in operation (1 - 30 min).

F3 Interfaces
This menu will help the user to define the status of the integrated serial and parallel interfaces, e.g. the baud rate of the RS 232 or the address of the IEEE interface.

F4 Keyboard beeper
F4 is the selector for the beeper On / Off mode.
The beeper is always on when a test routine is finished. To indicate that a running test is finished the beeper sounds 3 times.

F5 Power-on counter
Pressing of F5 will show the total operating time of the test equipment.

3.5. Source Settings

The source settings menu contains features that are specific to the VDS 200Q series.

SOURCE SETTINGS			
Vmax Pos	= 80.0V	Vmax neg	= -20.0V
Gain	= 8x	I peak	= NO Peak
Freq mode	= HF	Impedance	= 10 mR
Vnom	= 13.5V	I	= 200 A
			DEFAULT

Vmax Pos
Sets the limit of the maximum positive voltage that can be used. This is to protect DUTs and sensitive setups.

Vmax Neg
Sets the limit of the maximum negative voltage that can be used. This is to protect DUTs and sensitive setups.

Gain
The VDS 200Q has two gain settings. The normal operation is 8, but the user can also select a gain of 4. Note, however, that with a gain of 4, the maximum voltage output of the amplifier becomes 40V. For tests that do not require over 40V, gain 4 is recommended because the VDS 200Q is also much more efficient.

I peak

The current limitation of the VDS 200Q is very advanced. There are three settings:

3x Imax: This selection will allow an inrush current of three times the maximum current available from the generator for 200 ms before the current limitation starts. A VDS 200Q200 can produce 600A for 200ms, after which the voltage will be regulated down to achieve the maximum current limitation set.

3x Ictrl: This selection will allow an inrush current of three times the programmed current limit for 200 ms before the current limitation starts.

Peak OFF: This selection enables no inrush current above what is set. The current limit circuitry will start immediately.

Frequency mode

The VDS 200Qxx.2 supports three frequency ranges,

Std: Standard. This is the normal operating mode with a good compromise between stability and bandwidth. The bandwidth in this selection is approximately 40 kHz.

Capa: Capacitive. This mode is specifically designed for capacitive and/or reactive loads. This reduced bandwidth, high stability mode is perfect for use during normal transient testing, conducted sine wave (CSW) testing. The bandwidth in this mode is limited to approximately 3 kHz. This is the default startup mode, and is still fast enough for most common pulses like Pulse 4 and 2b.

HF: This mode is for testing where high bandwidths are required. This mode allows frequencies up to 250 kHz.

CAUTION:
As with all fast amplifiers, the user should monitor the DUT to ensure no ringing or excessive over- shoot is present that could result in damage to the DUT or couplers. In case there is a question the Capacitive mode should be used.

Impedance

The VDS 200Qxx.2 supports a selectable impedance from 10 mΩ to 200 mΩ or OFF (<10 mΩ according to ISO 7637-2)

Vnom

The battery setting that will be used, except in Source Mode.

I

The current limit setting in amps. Voltage will be reduced in order to not exceed the current limit setting after a time selected by the I peak setting.

4. Test Equipment

4.1. Construction

The Voltage Drop Simulator VDS 200Q200.2 and VDS 200Q150.2 are built into two parallel 19" racks and is divided into several parts: the control unit, the power stage and the power supply. All other models are built into a single 19” rack.

4.1.1. Overvoltage protection

General

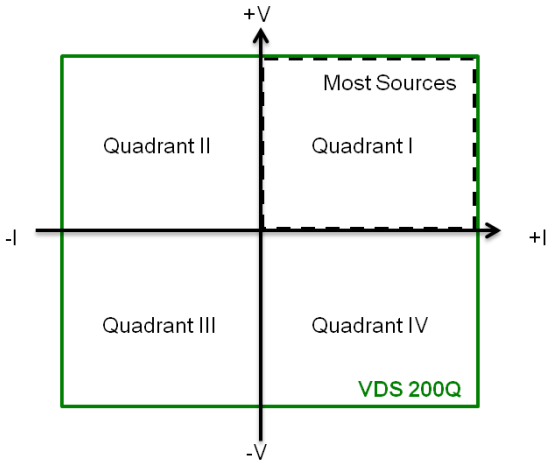
With the overvoltage protection the user can protect the output voltage in case of an unwanted overvoltage at the VDS200Qxx.2 output in case of wrong voltage setting or failure. The overvoltage protection is limited by restricting the power supply that powers the amplifier stage. The option to set 40V or 80V is found under the Service menu.

Sense Lines, if equipped, are for maximum of 8V cable losses.

CAUTION:
While the output of the VDS 200Q is floating, The battery negative pole should be within 10V of earth for safety reasons.
Do not put the simulator in parallel with other sources.

4.1.2. Output Behavior

The VDS 200Q is a four-quadrant source. Four-quadrant operation means that the VDS 200Qxx.2 can source and sink current using a programmed voltage in both polarities, as well as voltage in both polarities.



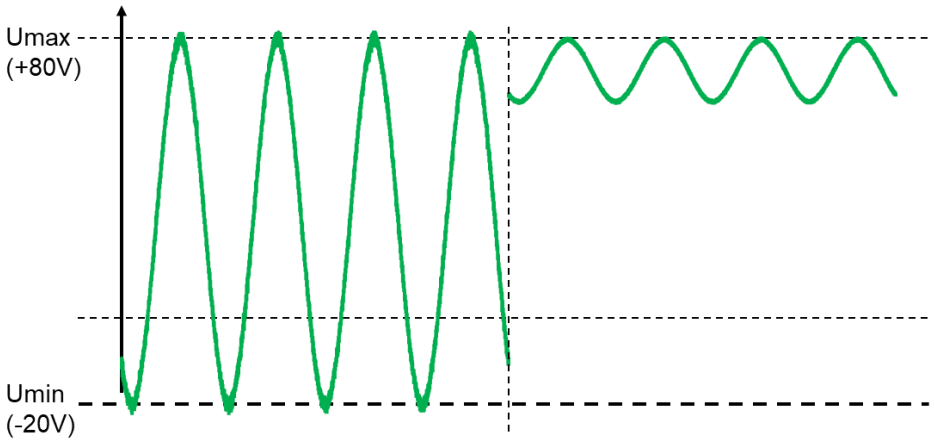
Please note that if a DUT has an input capacitance, this will be discharged through the VDS if the VDS voltage is reduced below that stored in the capacitor, i.e. the DUT will be completely discharged if the voltage is set to zero.

Likewise, when generating a sine wave, the full power of the amplifier can be applied to a capacitive load. The current limit of the VDS 200Qxx.2 applies also to AC operation, like is often found in sinusoidal variations. One must consider the capacitive reactance at the necessary test frequency when determining if a test could be performed with a certain DUT.

$$X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C}$$

The full range of voltage and bandwidth can be used with the VDS 200Qxx.2. You are only limited by the maximum and minimum voltage, as well as the maximum frequency, as set.

For example, both of the following simulations are possible at well over 100 kHz:



As the VDS 200Q series is capable of negative voltages, care should be taken that the VDS 200Q is not used in the negative voltage range when a PFS 200N or LD 200N are connected. A setting is available to avoid overvoltage or undervoltage.

CAUTION:
Producing negative voltages with the VDS 200Q will damage the PFS 200N or LD 200N!
The user must disconnect the PFS 200N and LD 200N before performing tests that require negative voltages!

The maximum current that can be fed back from the DUT is equal to the maximum rating of the amplifier. For example, the VDS 200Q200.2 can source 200A permanently, or accept 200A return current permanently up until temperature shutdown.

Several redundant temperature-monitoring functions control the fans in multiple steps. A final “temperature shutdown” is also implemented to prevent damage due to overheating, but should generally not be seen in normal use in laboratory conditions.

Many sources are specified in Watts where the output current is dependent on the output voltage VDS 200Qxx.2 are unique in that they are specified in voltage and current only and therefore can provide up to the maximum current of the VDS from near zero volts up to the full 80V.

As mentioned above, there is no restriction of using the full voltage range over the entire frequency bandwidth.

4.1.3. Ri settings

The VDS 200Qxx.2 features a selectable Ri setting from 10 mΩ to 200 mΩ in 10 mΩ steps. "OFF" is also available for users who prefer to use the minimum source impedance available from the VDS 200Q (approx. 3 mΩ). "OFF" should be used for most testing in accordance to ISO 7637-2, which defines <10 mΩ.

Users who choose to use this Ri setting should be aware that this mostly manifests itself as a voltage drop at the DUT as the Ri and the load form a voltage divider. When sense is used together with the programmable Ri, only the voltage drop of the cables are compensated. Voltage drop due to high Ri settings are not compensated.

4.1.4. Sense Lines

Sense lines are provided to compensate for voltage drop of up to 8V through the cables.

Sense lines (see the next section) only compensate for cable voltage drop, and not voltage drop from the additional Ri resistance as this voltage drop is expected.

Sense lines can be run to the load/DUT using the provided connectors. Pay special attention to the polarity of the sense lines or damage could result to the VDS 200Q. Also, there is an inherent voltage drop used by most transient generators, for example when diodes are used for coupling. This cannot be corrected using sense because firing transient pulses into the sense lines is not supported and can result in unexpected behavior and/or damage to the VDS 200Q.

CAUTION:
Transient pulses may not be fired into the sense lines. Sense lines may not be used at the DUT when performing transient immunity testing or unexpected behavior from, and/or damage to the VDS 200Q can occur.

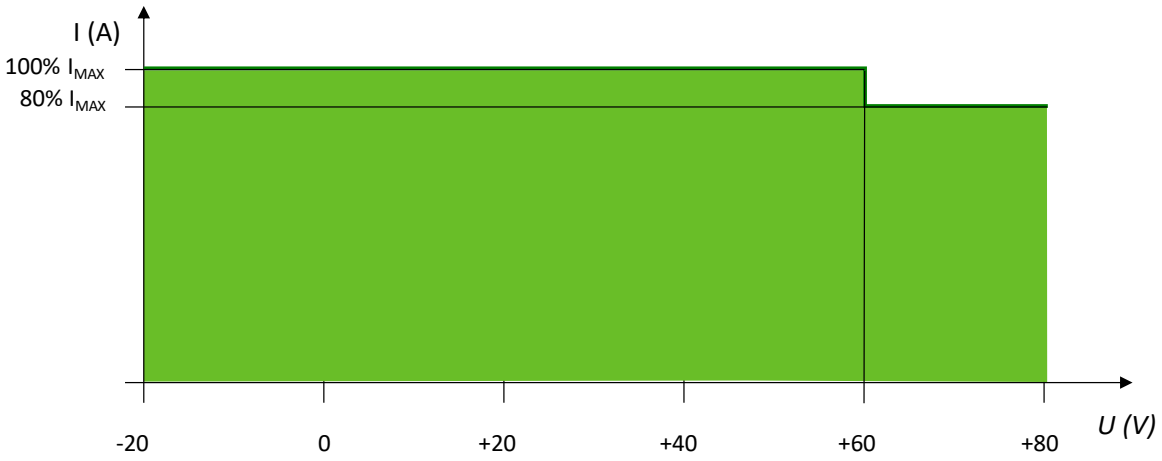
CAUTION:
Pay special attention to the polarity of the sense lines or damage can occur to the VDS 200Q.

4.1.5. New Features VDS 200Qxx.2

The VDS 200Qxx.2 supports an expanded test envelope with the following capability. This example uses the VDS 200Q200.2:

- Voltage range expanded to +80V / -20V
- Up to 250 kHz bandwidth
- Programmable Ri
- Improved linearity

Derating at Frequency in Extended Operating Mode



Derating at Current in Extended Operating Mode

NOTE: In default usage, this is carefully regulated current limit. When using the extended capabilities, the current limit is a hard hardware limitation and therefore, you may see more noise on the voltage signal when using the extended test envelope while in current limit.

5. Technical Data

5.1. Test level

Voltage for VDS 200Q		U = to 80 V ± 2% ± 50 mV with 0.1 V steps setting
Output resolution Front panel setting		approx. 50 mV at 0…80 V
Output resolution AutoWave setting		AutoWave ADC 16 Bit: Resolution < 1 mV
Current	VDS 200Q200.2	I = 0 A – ± 200 A ± 5% (600 A for 200 ms)
	VDS 200Q150.2	I = 0 A – ± 150 A ± 5% (450 A for 200 ms)
	VDS 200Q100.2	I = 0 A – ± 100 A ± 5% (300 A for 200 ms)
	VDS 200Q50.2	I = 0 A – ± 50 A ± 5% (150 A for 200 ms)
	VDS 200Q25.2	I = 0 A – ± 25 A ± 5% (75 A for 200 ms)
		Independent of programmed voltage and voltage range.
Bandwidth (-3dB)		DC-250 kHz
Rise Time		Typ. <3us (High Freq.), <10 us (Standard)
Source impedance		Zi = < 10 mΩ, 10 mΩ - 200 mΩ in 10 mΩ steps ± 2% ± 5 mΩ Zi = Ri (DC ... 400 Hz)
Recovery time t_{rec}		t_{rec} = 90 % of max. excursion within 25 µs
Current limiter I_{limit}		I_{limit} = 1...Imax
Voltage ripple U_r		U_r = < 0.2 V peak to peak
Pulses		as per test routines

5.1.1.Sense

Settling Time	4 µs/V
Accuracy	±5% of the necessary correction
Max Correction	8V

5.2. Trigger

Automatic	Auto release with preselected parameters
Manual	Manual release of a single event
Extern	External release by external trigger
Repetition rate	10 ms – 99 s
Drop out duration td	10 µs to 9900 ms
Dip duration	10 µs to 9900 ms

5.3. Input/output

Test supply + / - output	Safety laboratory connectors at front panel High current connectors at rear panel
AUX IN	Safety laboratory connectors at rear panel
Analog input	-10 to +10 V / 10kΩ / DC – 250 kHz
External trigger input	5 – 15 V TTL signal (BNC connector)
CRO trigger output	5 V TTL signal (BNC connector)

5.4. Interfaces

Serial interface USB	Baudrate: Setting; 1,200 to 19,200 Baud
Parallel interface	IEEE; addresses 1 - 30

5.5. General

Dimensions	Device in Rack	HU	Dimensions H x W x D*	Weight
VDS 200Q25.2	19” Rack	25 HU	132 x 55 x 80 cm	230 kg
VDS 200Q50.2	19” Rack	25 HU	132 x 55 x 80 cm	275 kg
VDS 200Q100.2	19” Rack	38 HU	194 x 55 x 80 cm	450 kg
VDS 200Q150.2	Double 19” Rack,	38 HU	185 x 111 x 80 cm	700 kg
VDS 200Q200.2	Double 19” Rack,	38 HU	185 x 111 x 80 cm	900 kg

*Rack depth is 80mm with the mains connector protruding a approx 2-3cm out of the back of the rack, depending on the model.

CAUTION:
The simulator has high inrush as well as leakage current. Use pluggable equipment type B connections according to IEC 309 to avoid tripping the breaker in the laboratory.

Supply voltage, Fuses and input current

Device	Mains Phases	Supply Voltage U_{eff}	Primary Current I_{eff}	Inrush at start	Circuit Breaker*
VDS 200Q25.2/100	1	100 V ±10%	25 A_{RMS}		1 x 25A
VDS 200Q25.2/120	1	120 V ±10%	24 A_{RMS}		1 x 25A
VDS 200Q25.2/230	1	230 V ±10%	12 A_{RMS}		1 x 16A
VDS 200Q50/200	3	200 V ±10%	Typ. 16 A_{RMS}/phase		1 x 25A
VDS 200Q50/400	3	400 V ±10%	Typ. 9 A_{RMS}/phase	225A	1 x 16A
VDS 200Q100.2/400	3	400 V ±10%	Typ. 16A_{RMS}/phase	450A	2 x 16A*
VDS 200Q150.2/400	3	400 V ±10%	Typ. 25A_{RMS}/phase	675A	3 x 16A*
VDS 200Q200.2/400	3	400 V ±10%	Typ. 30A_{RMS}/phase	900A	4 x 16A*

* The power supplies for the system are in parallel. For example, the 100A version contains two 16A three-phase breakers, making the total maximum current draw before shutdown 32A/phase.

Power Consumption and Heating
As a class A amplifier the VDS 200Q-series consumes nearly as much power in with no load as with full load as seen in the following table.

	VDS 200Q25.2	VDS 200Q50.2	VDS 200Q100.2	VDS 200Q150.2	VDS 200Q200.2
0% I_{MAX}, 0V	340 W est.	688 W	1404 W	2222 W	3024 W
50% I_{MAX}, 80V	420 W est.	843 W	1538 W	2340 W	3000 W
80% I_{MAX}, 80V	500 W est.	1104 W	1685 W	2875 W	3580 W

For the purpose of cooling, the power consumed by the DUT must be added.

5.6. Environmental conditions

Temperature range:	Operation at +10 to +45°C Storage and transport at -10 to +60°C
Humidity:	30 to 70% (non condensing)
Pressure:	860 to 1060 hPa
Protection Class:	IP20

6. Maintenance

6.1. General

The generator contains no user-serviceable parts inside.

6.2. Test set-up

When setting up the test national and international regulations regarding human safety have to be guaranteed.

The test setup must conform to the national and international regulations.

The generators of the series 200, UCS, LD, PFM, VDS and AutoWave, can be linked together to a fully automotive test set-up.

The set-up communicates via the IEEE/GPIB bus and is controlled by ISM ISO software. For setting up the system see the following figures:

Each generator can be operated individual as single equipment.

6.3. Test set-up with software iso.control

By using iso.control software:

- Connect the VDS 200Q to a computer running iso.control via GPIB or USB

By using autowave.control software

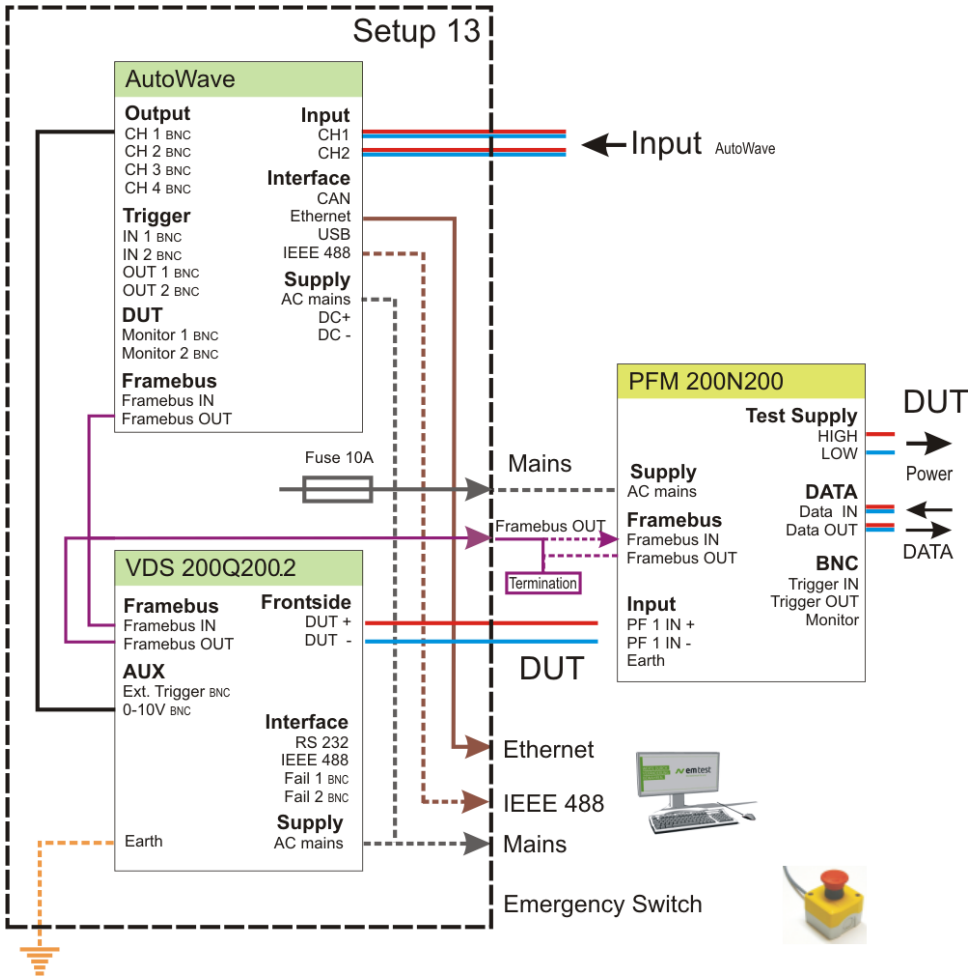
- Connect the VDS 200Q to a computer running autowave.control via GIPB or USB

6.4. Example Test setup with AutoWave and VDS 200Q

Setup 13
example with:

Rack
AutoWave
VDS 200Q200

Exernal:
PFM 200N200



6.5. Calibration and Verification

6.5.1. Factory calibration

Every EM TEST generator is entirely checked and calibrated as per international standard regulations before delivery. A calibration certificate is issued and delivered along with a list of the equipment used for the calibration proving the traceability of the measuring equipment. All auxiliary equipment and accessories are checked to our internal manufacturer guidelines.

The calibration certificate and the certificate of compliance (if available) show the date of calibration.

The AMETEK CTS equipment are calibrated in the factory and marked with a calibration mark. The used measuring instruments are traceable to the Swiss Federal Office of Metrology.
The calibration date is marked. The validity of the calibration is to the responsibility of the user's quality system. Neither the certificate of calibration nor the corresponding label mark any due date for re-calibration.

Example: Calibration mark

6.5.2. Guideline to determine the calibration period of AMETEK CTS instrumentation

Our International Service Departments and our QA Manager are frequently asked about the calibration interval of AMETEK CTS equipment.

AMETEK CTS doesn't know each customer's Quality Assurance Policy nor do we know how often the equipment is used and what kind of tests are performed during the life cycle of a test equipment. Only the customer knows all the details and therefore the customer needs to specify the calibration interval for his test equipment.

In reply to all these questions we like to approach this issue as follows:
AMETEK CTS make use of a solid state semiconductor switch technique to generate high voltage transients. A precious advantage of this technique is the absolute lack of periodical maintenance effort. In consequence, thereof a useful calibration period must be defined based on two criteria:

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation must be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment must be taken into consideration.

- Based on the experience and observation collected over the years **AMETEK CTS recommend a calibration interval of 1 year** for frequently used equipment. A 2-years calibration interval is considered sufficient for rarely used test generators in order to assure proper performance and compliance to the standard specifications.

6.5.3. Calibration of Accessories made by passive components only:

Passive components do not change their technical specification during storage. Consequently, the measured values and the plots stay valid throughout the storage time. The date of shipment shall be considered as the date of calibration.

6.5.4. Periodic In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, AMETEK CTS suggests to refer to the wave shape and values of the original calibration certificate.

All calibrations and verifications are always done without mains supply voltage connected to the coupling network input.

7. Delivery Groups

7.1. Basic equipment VDS 200Qxx.2

- VDS 200Q200.2 in double Rack (2 x 34HU)
- Three-phase mains connector (63 A)
- Emergency switch
- Connectors 200A (red/black, coded, 2 each)
- Ethernet cable
- 1 x Framebus cables
- 1 x Framebus terminator, No 101732
- BNC Jumper Cable (0.15m) for CH1 to VDS 200Q150.1

Options:
- Drawer for AutoWave
- Interconnection cables for PFM 200N200 (part of PFM 200N200 delivery) and/or AutoWave (if built into the rack or delivered with the VDS 200Q system)

7.2. Accessories and options

- **User software „iso.control“**
  - Test, analysis and documentation with windows (see separate documentation)
  - License version for testing according the most automotive standards
  - Report generator with export function to wordprocessor program.

- **AutoWave**
  - Arbitrary generator 16bit resolution 0...10V for external VDS control.
  - The AutoWave replaces the 8bit resolution of the internal VDS 200N controller.
  - AutoWave.control software for individual control of the AutoWave

8. Appendix

8.1. Declaration of CE-Conformity

8.1.1. Declaration of CE-Conformity VDS 200Qxx.2

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Voltage Drop Generator
Model Number(s)	VDS 200Q25.2 VDS 200Q50.2 VDS 200Q100.2 VDS 200Q150.2 VDS 200Q200.2 VDS 200Q100.2

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)
EN 61000-3-2:2014	Limits for harmonic current emissions
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer
AMETEK CTS GmbH
Sternenhofstr. 15
CH 4153 Reinach
Tel: +41 61-7179191
Fax: +41 61-7179199

By	A. Burger Director Engineering
Place	Reinach BL, Switzerland
Date	1. July 2018

8.1.1.1. Connectors

General

Live parts are on the plugging side touch protected in the unmated condition as per:
IEC, EN 60529, DIN VDE 0470, part 1
IEC, EN 61010-2-031, VDE 0411, part 2-031

For additional connectors please download the catalogue from Multi Contact: www.multi-contact.com

8.1.2. Connectors VDS 200Qxx.2

Panel receptable

Plug ID/S10BV-C... with bayonet locking and threaded stud

Multi Contact code	Description
ID/S10BV…	Receptacle 10 mm 250 A C1 coded (Red)
ID/S10BV…	Receptacle 10 mm 250 A C4 coded (Black)

DUT Connection Provided

Sockets with bayonet locking and AxiClamp termination for flexible cables class 5 and class 6 as per IEC 60228. Touch protected in unplugged condition (IEC, DIN EN 60529. With AxiClamp, the reusable screw termination for cables.

Multi Contact code	Description
KBT10BV-AX/M25/50-70…	Coupler 10 mm 250 A red, C1 coded, positive
KBT10BV-AX/M25/50-70…	Coupler 10 mm 250 A red, C4 coded, negative

Sense Connection Provided

2mm banana set, red and black

8.2. VDS 200Q Menu overview