Manual
for Operation

VDS 200Q10 series

Voltage Drop Simulator pulses 2b, 4

- VDS 200Q10, VDS200Q10.1

Testing of electronic modules in 12V/24V or 42V supply systems.

The VDS 200Q10 series 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 600W. 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.

- 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 200Q10 series models

Standard models

Model	voltage	current	inrush current	Sine f max
VDS 200Q10-100	-60 to +60 V	Imax = ±10 A	Not supported	180 kHz
VDS 200Q10-120	-60 to +60 V	Imax = ±10 A	Not supported	180 kHz
VDS 200Q10-230	-60 to +60 V	Imax = ±10 A	Not supported	180 kHz
VDS 200Q10.1-100	-60 to +60 V	Imax = ±10 A	Not supported	180 kHz
VDS 200Q10.1-120	-60 to +60 V	Imax = ±10 A	Not supported	180 kHz
VDS 200Q10.1-230	-60 to +60 V	Imax = ±10 A	Not supported	180 kHz

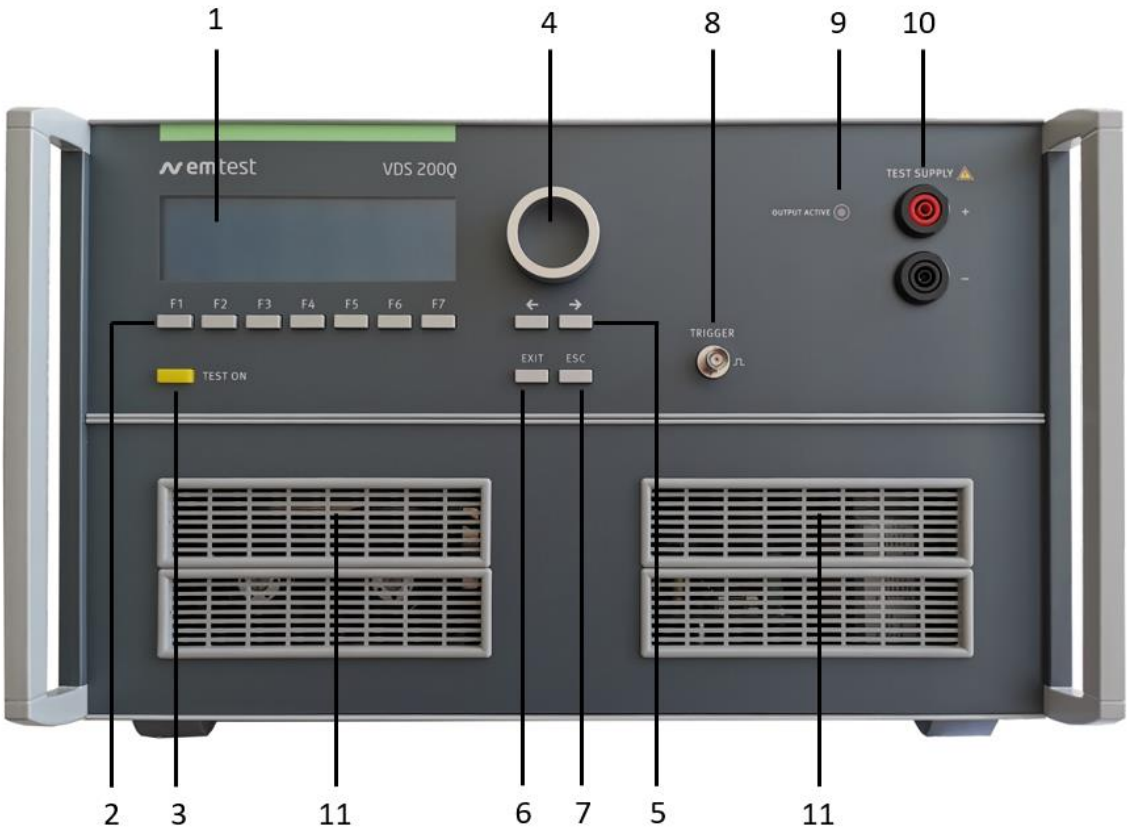
1.2. Construction

The Voltage Drop Simulator VDS 200Q10.x is built in a 19" / 6HU housing.

On request the VDS 200Q10.x generator could also be built into a rack.

2. Operating Functions

2.1. Front view VDS 200Q10.x



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 LED OUTPUT ACTIVE
10 Test Supply
11 Cooling

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.

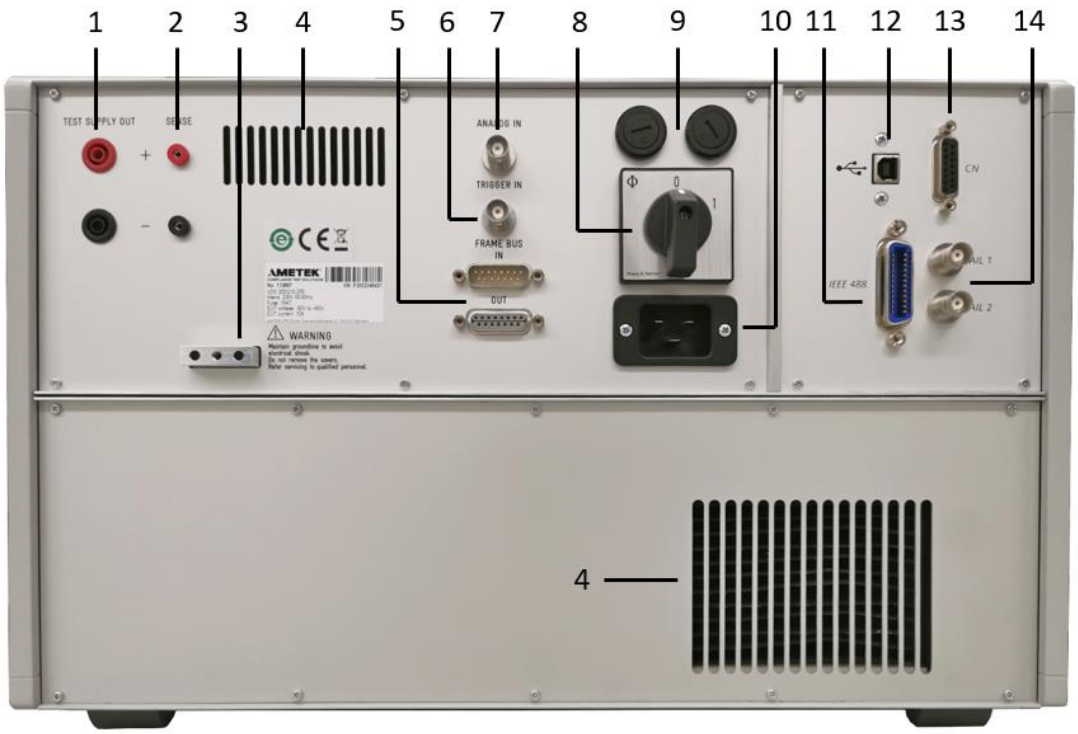
8 BNC CRO Trigger
At the BNC connector CRO TRIGGER a signal is available to trigger an oscilloscope.

9 LED OUTPUT ACTIVE
This LED is on during the power on status.

10 Test Supply
Output to the DUT or other generators.
4mm banana connectors.

11 Cooling
Grid with fans for cooling behind. Ensure nothing blocks the air circulation (distance > 0.5m)

2.2. Rear view VDS 200Q10.x



1	TEST SUPPLY OUT	**8**	Mains switch
2	SENSE	**9**	Mains fuse
3	Reference ground connection	**10**	Mains input
4	Cooling	**11**	IEEE 488.1
5	FRAME BUS	**12**	USB port
6	TRIGGER IN	**13**	CN interface
7	ANALOG IN	**14**	FAIL1 / FAIL2

1 TEST SUPPLY OUT
Output to DUT

2 Sense
Sense lines to compensate voltage drop across connection VDS – DUT (max. 4V)
Note: Sense lines are only supported for VDS 200Q10.1 models and higher.

3 Reference ground connection
Massive metal ground point to be connected to a reference ground point in the system during testing.

4 Cooling
Grid with or without fans for cooling behind. Ensure you do not block these grids.
Minimum distance to a wall or other blocking objects >20cm

5 FRAME BUS
EM Test internal communication bus. Daisy chain all equipment connected to the bus, terminate at the end of the chain.

6 TRIGGER IN
External trigger IN signal

7 ANALOG IN
-10 / +10VDC. Connection to AutoWave or an external arbitrary waveform generator.

8 Mains switch
To power up the equipment

9 Mains fuse
230 Vac, 6.3 A, 5 x 20 mm
115 Vac, 10 A, 5 x 20 mm
100 Vac, 16 A, 5 x 20 mm

10 Mains input
Max. 16A, depending on power mains voltage.

11 IEEE 488 / GPIB
Parallel IEEE 488 interface to remote control the generator with a software tool.

12 USB Port
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.
Interface is supported for iso.control, but not for autowave.control (either IEEE or FRAME BUS).

13 CN interface
Interface to other EM TEST devices, currently not used

14 FAIL1 / FAIL2
FAIL 1 can be used for failure detection at the DUT. If the input is set to ground (chassis) the generator stops and terminate the test. The SW test routine than can be stopped completely continued at the break point. A message of FAIL 1 is indicated in the LCD display as well as in the ISM software.

FAIL2 can be used for failure detection at the DUT. If the input is set to ground (chassis) the actual test routine is paused as long as the low level signal is available at the FAIL 2 input. With no longer set to ground signal the test procedure continues automatically. A message of FAIL 2 is indicated in the LCD display as well as in the ISO.CONTROL software.

2.3. Safety with voltage setting

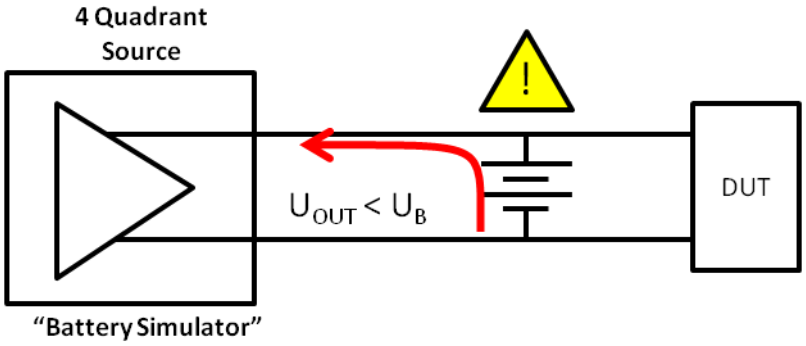
To ensure a safe operation of the DUT (Device Under Test) some restrictions in the operation of the instrument are built in. These restrictions are explained within this paragraph.

CAUTION:
The VDS 200N and VDS 200Q series, as well as most linear power amplifiers will create spikes at start and stop. 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 200Q10.x with a parallel battery.

A four-quadrant source, like the VDS 200Q10.x 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 the the battery.

However, when using a four-quadrant source like the VDS 200Q10.x 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 200Q10.x or a dangerous condition can occur by exceeding the current of the VDS 200Q10.x, or overheating the battery.

CAUTION:
While the output of the VDS 200Q10.x 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.

The VDS 200Q10.x 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 (VDS Generator - User Test Routines - DC Source)
Within this mode the VDS 200Q10.x is used as a simple DC power source in the range of up to 60V / 0-10A and an integrated current limiter.

Arbitrary Wave Simulator
Within this mode the VDS 200Q10.x 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 200Q10.x 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 0-180kHz. The output power (EUT test supply) is capable of +60V / -60V and a nominal current depending on setting. For example, a 2V input signal would result in 14V output.

1. DC source

When entering the Arbitrary Wave test mode the dc output voltage of the VDS 200Q10.x 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 200Q10.x 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
V D S 2 0 0 Q10.1 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 200Q10.1

3.2. Main Menu

MAIN MENU

F1 : Wave Simulator

F7 : Service

F1 F2 F3 F4 F5 F6 F7

F1 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.

F7 Service

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

3.2.1. Change of parameters

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.

Page 5 (Show parameters)

ISO Pulse 4						
Vb	=	12.0V	Va1	=	-7.0V	
Va2	=	-3.0V	t1	=	0.2s	
t6	=	5ms	t7	=	5ms	
t8	=	5ms	tf	=	5ms	
Va	=	13.5V	tri	=	Auto	
I	=	5A				
Start		Change				
F1		**F2**	**F3**	**F4**	**F5**	**F6** **F7**

Press **START** and the test routines begin to work.
Press **CHANGE** and the actual parameter can be changed.

Page 6 (Change of page 1/2)

ISO Pulse 4							
Vb:	0.0V	-	60.0V				
Vb	Va1	Va2	t1	t6	t7		
12.0	-7.0	-3.0	0.2	5	5		1/2
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	

Page 6 (Change of page 2/2)

ISO Pulse 4							
t8:	0.1 s	-	99.9 s				
t8	tf	Va	tri	I			
13.5	5	13.5	Auto	5			2/2
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	

The user can select the parameter to be changed with the related function key and change the value by turning the knob. The cursor allows the user to define the value of the digit to be changed (fast or slow change).

Pressing of the ESC button will bring the user back to the previous level from where the test can be restarted with new parameters.

Page 6 (Start)

ISO Pulse 4						
Vb	=	12.0V	Va1	=	-7.0V	
Va2	=	-3.0V	t1	=	0.2s	
t6	=	5ms	t7	=	5ms	
t8	=	5ms	tf	=	5ms	
Va	=	13.5V	tri	=	Auto	
I	=	5A	I	=	3.5 A	
Stop		Zoom	V	=	7.0 V	
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

After start the actual voltage and current measurements are displayed. All function keys except F2 (Man) within the manual trigger mode can stop the test routine. The latest setting will be displayed.

Pressing the key **F3** while the test is running, the display change to the **ZOOM** mode and is indicating the actual voltage and current measurement in big letters.

Page 6 (Stop)

ISO Pulse 4						
Vb	=	12.0V	Va1	=	-7.0V	
Va2	=	-3.0V	t1	=	0.2s	
t6	=	5ms	t7	=	5ms	
t8	=	5ms	tf	=	5ms	
Va	=	13.5V	tri	=	Auto	
I	=	5A	I	=	3.5 A	
Stop		Zoom	V	=	7.0 V	
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

By pressing any function key the **Start**, **Change** or **Continue** mode will come up in the display. F3 will continue the same test routine. Also the test time will continue running. If the user first selects **Start** or **Change**, the test will be stopped completely.

Start	Change	Cont.				
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

3.3. Wave Simulator

Page 2

Waveform Simulator

F1 : Standards
F2 : Functions
F3 : DC Power Supply

F1 F2 F3 F4 F5 F6 F7

Page 3

STANDARDS

F1 : ISO 7637
F2 : ISO 16750-2 or WD 03/2000-2

F1 F2 F3 F4 F5 F6 F7

Pages 4

ISO 7637
F1: Pulse 4
F2: Pulse 2b

ISO 16750-2 WD 03/2000-2
F1: Short voltage drop
F2: Slow decrease / increase
F3: Supply voltage profile
F4: Pulse 'Starting profile'
F5: Sweep
F6: Overvoltage Vmax

Page 3

FUNCTIONS

F1 : Sinus
F2 : Jumpstart
F3 : VDS Extern
F4 : Pulse 4 (GM 9105P)

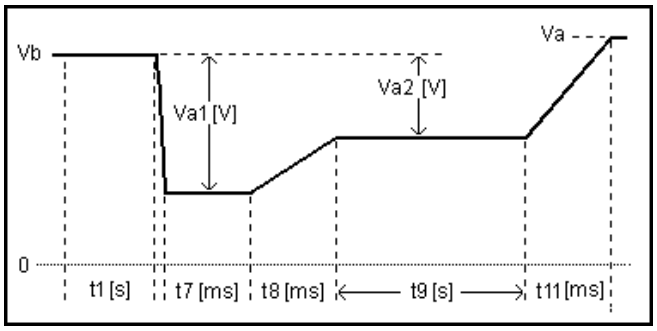
F1 F2 F3 F4 F5 F6 F7

3.3.1. ISO 7637

3.3.1.1. 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



Input restrictions

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

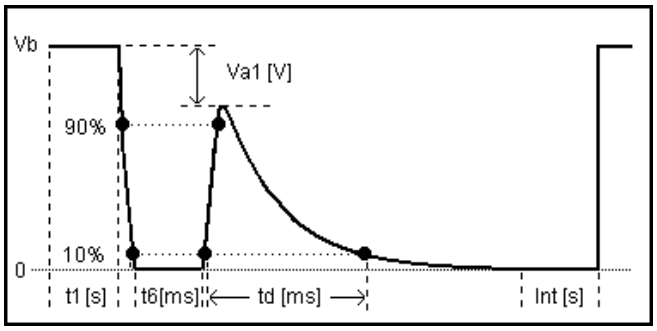
Parameters:

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

3.3.1.2. Pulse 2b

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

tr, tf (10/90%) =1ms ± 50%



Input restrictions

Va1 ≤ 0.0V
0.0 V ≤ Vb + Va1 ≤ 60.0V

Parameters:

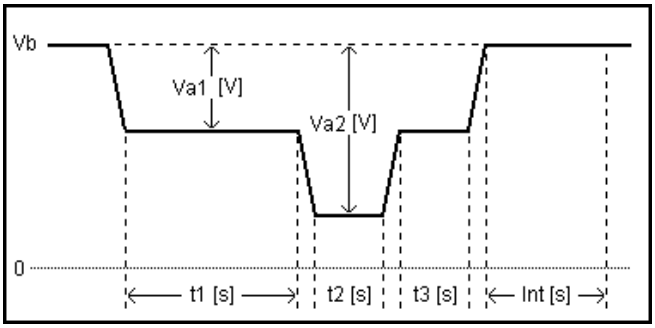
Vb	0.0V	-	+60.0V
Va1	- 60.0V	-	0.0V
t1	0.1s	-	99.9s
t6	1ms	-	999ms
td	5ms	-	9999ms
int	0.1s	-	99.9s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

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

3.3.2.1. Short voltage drop

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

tr, tf = < 10ms



Input restrictions

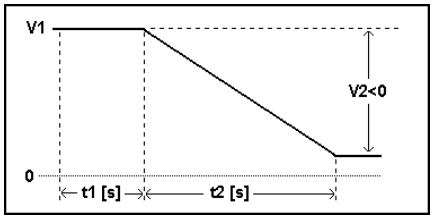
0.0 V ≤ Vb + Va1 ≤ 60.0V
0.0 V ≤ Vb + Va2 ≤ 60.0V

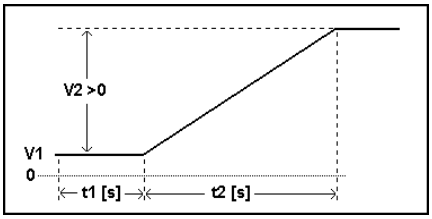
Parameters:

Vb	0.0V	-	+60.0V
Va1	- 60.0V	-	+60.0V
Va2	- 60.0V	-	+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)

3.3.2.2. Slow decrease / increase

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





Parameters:

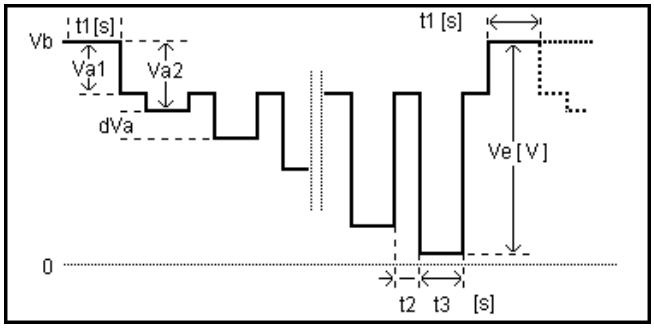
V1	0.0V	-	+60.0V
V2	- 60.0V	-	+60.0V
t1	0.1s	-	99.9s
t2	0.1s	-	9999.9s
I	1A	-	(Imax)

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

3.3.2.3. 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.



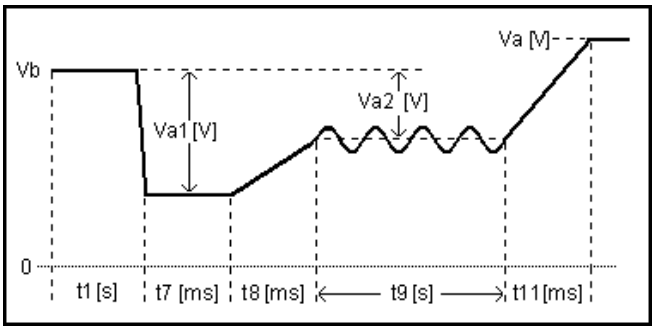
Parameters:

Vb	0.0V	-	60.0V
Va1	- 60.0V	-	60.0V
Va2	- 59.9V	-	60.0V
Ve	- 60.0V	-	60.0V
dVa	- 60.0V	-	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)

3.3.2.4. Pulse 'Starting profile'

This test simulates a motor startup including a possible ripple.

tr, tf = < 10ms
Ripple = 2Hz



Input restrictions

0.0 V ≤ Vb + Va1 ≤ 60.0V
0.0 V ≤ Vb + Va2 ≤ 60.0V

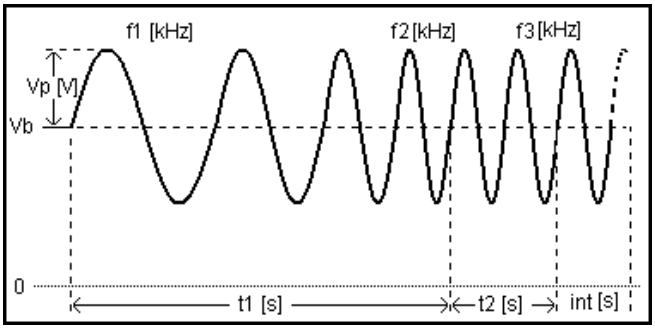
Parameters:

Vb	0.0V	-	60.0V
Va1	- 60.0V	-	60.0V
Va2	- 60.0V	-	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)

3.3.2.5. Sinus Sweep

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

During Int f3 is applied.



Limitations

Vb + Vp <= 60.0V
Vb - Vp >= 0.0V

Parameters:

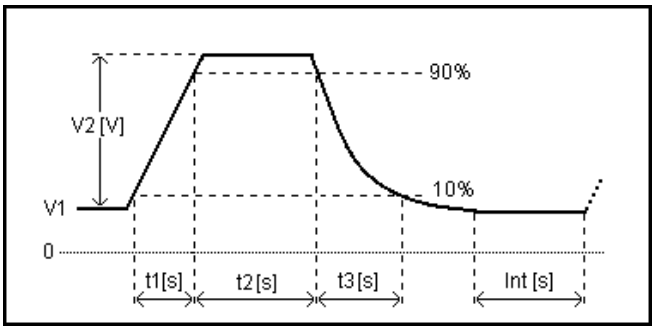
Vb	0.0V	-	60.0V
Vp	0.0V	-	0.1 – 60V
f1	0.001Hz	-	180.000kHz
f2	0.001Hz	-	180.000kHz
f3	0.001Hz	-	180.000kHz
t1	0.1s	-	999.9s
t2	0.1s	-	999.9s
int	0s	-	999s
n	1	-	30,000 / endl.
tri	Auto / Manual		
I	1A	-	(Imax)

3.3.2.6. Overvoltage Vmax

This test simulates a high energy load dump pulse.

Input restrictions

0.0 V ≤ V1 + V2 ≤ 60.0V

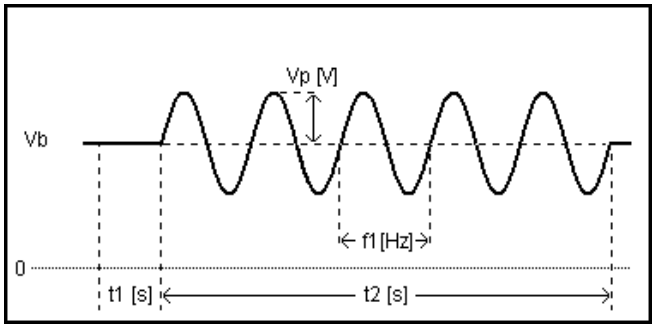


Parameters:

V1	0.0V	-	60.0V
V2	0.0V	-	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)

3.3.3. Functions

3.3.3.1. Sine wave



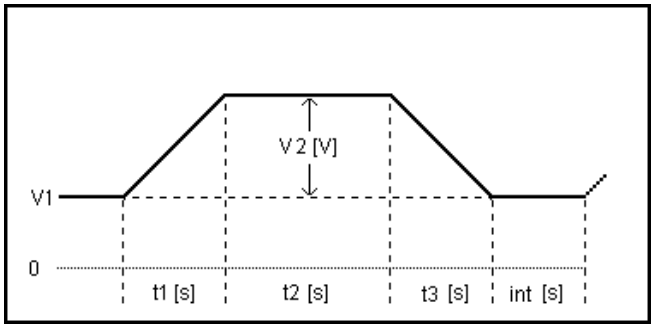
Limitations
Vb + Vp <= 60.0V
Vb - Vp >= 0.0V

Parameters:

Vb	0.0V	-	60.0V	
Vp	0.1V	-	60.0V	
t1	0.1s	-	99.9s	
f1	0.001kHz	-	180.00kHz	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.

3.3.3.2. Jump Start



Limitations

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

Parameters:

V1	0.0V	-	60.0V
V2	- 60.0V	-	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)

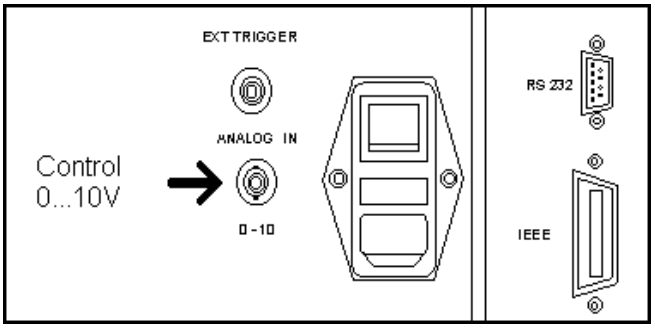
3.3.3.3. VDS Externally via the analog input

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

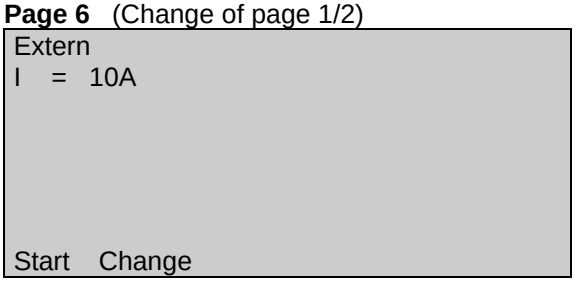
For this purpose the operator must select **VDS Extern** by pressing the related function key. The Extern mode is displayed and the unit can only be operated via the coaxial BNC input **ANALOG IN** at the rear part.

Parameters:

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

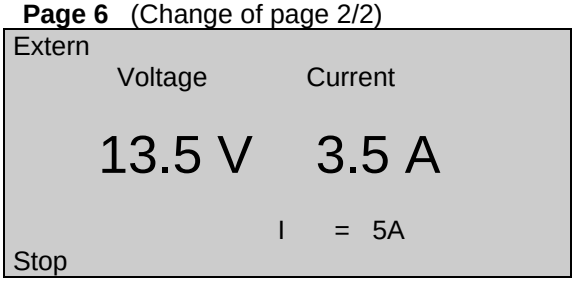


Page 6 (Change of page 1/2)



F1 F2 F3 F4 F5 F6 F7

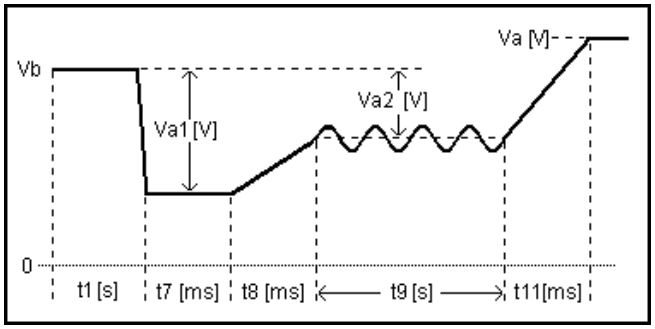
Page 6 (Change of page 2/2)



F1 F2 F3 F4 F5 F6 F7

3.3.3.4. 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

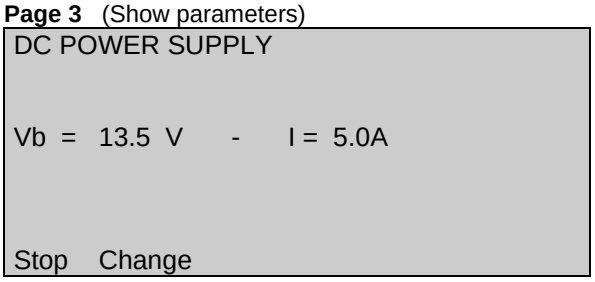
0.0 V ≤ Vb + Va1 ≤ 60.0V
0.0 V ≤ Vb + Va2 ≤ 60.0V

Parameters:

Vb	0.0V	-	60.0V
Va1	- 60.0V	-	60.0V
Va2	- 60.0V	-	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)

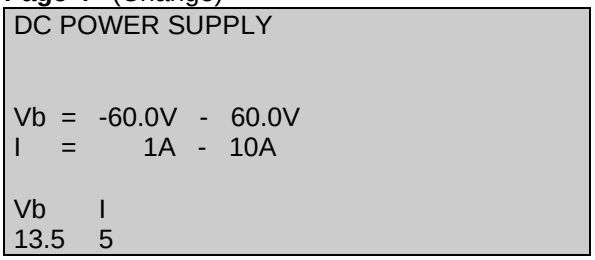
3.3.3.5. DC source

Page 3 (Show parameters)

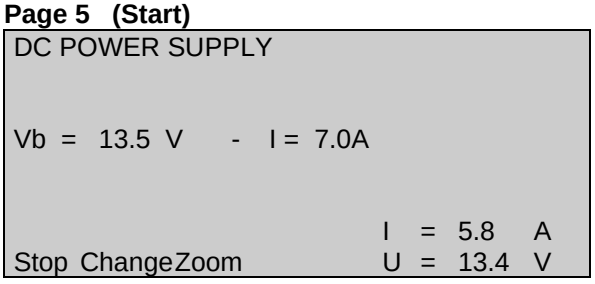


The user can select the parameter to be changed with the related function key and change the value by turning the knob. Pressing of the ESC button will bring the user back to the previous level from where the test can be restarted with new parameters.

Page 4 (Change)



Page 5 (Start)



After Start the actual voltage and current values are displayed. All function keys. The latest setting will be displayed.

Pressing the key F3 while the test is running, the display is switched over to the **ZOOM** mode and is indicating the actual voltage and current measurement in zoomed letters.

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

The blinking value can be changed with the knob Inc/Dec. To select other values for change use the cursor keys.

3.4. Service

All service functions are indicated on the display.

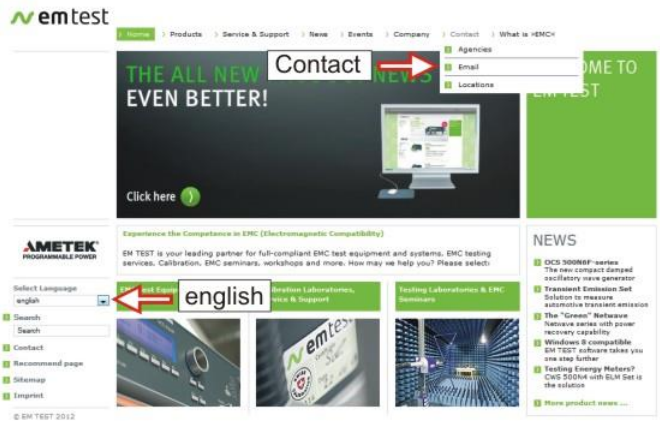
SERVICE
F1 : Addresses F2 : Selftest F3 : Setup
F5 : Set Voltage F6 : Source Setting

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 200Q10 series as explained in the next chapter.

Set voltage

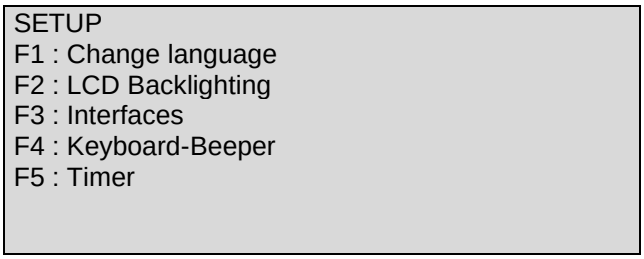
Power On setting of the following parameters:

F1: Vn Nominal supply voltage for the DUT. By selecting **Vn** in all voltage settings, the voltage in this Set voltage menu will be taken.

F2: I Maximal current setting for the VDS 200Q10.x after power ON.

3.5. Setup

This menu helps the user to define the configuration of the VDS 200Q10.x series.



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 Timer
Pressing of F5 will show the total operating time of the test equipment.

3.6. Source Settings

The source settings menu contains features that are specific to the VDS 200Q10.x series.

SOURCE SETTINGS						
F1 : Output voltage range						
F3 : Amplifier Gain						
F5 : Current limitation mode						
F7 : Frequency Compensation						
Vrange		Gain		Climit		Fcomp
-60/+60		x7		Peak OFF		Std
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

F1 Output voltage range
The VDS 200Q10.x has a fixed output range of -60V to +60V.

F3 Amplifier Gain
The VDS200Q10.x generators offer 2 different GAIN setting:
x1: limits the output voltage to +/-10V
x7: limits the output voltage to +/-60V (full range)

F5 Current limitation mode
Different to other VDS200Qx.y units (e.g. VDS200Q50.2), the current limitation of the VDS 200Q10.x is limited to Peak OFF. There is no inrush current you get on top of the RMS current limiter.

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

F7 Frequency Compensation
The VDS 200Q10.x support 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.

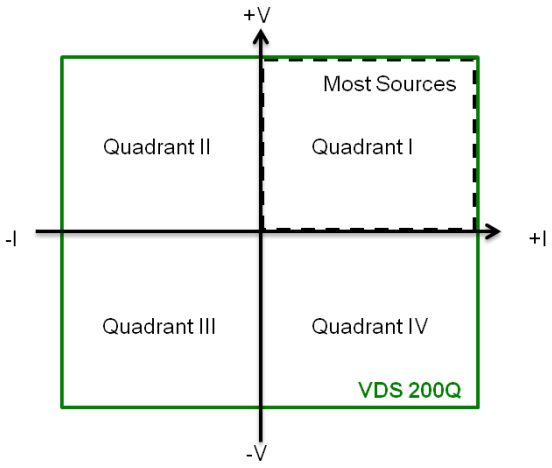
Capa: Capacitive. This mode is specifically designed for capacitive and/or reactive loads. This reduced bandwidth, high stability mode is perfect for use during normal transient testing, conducted sine wave (CSW) testing. The bandwidth in this mode is limited to approximately 3 kHz. This is the default 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 180kHz.

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.

3.6.1. Output Behavior

The VDS 200Q10.x is a four-quadrant source. Four-quadrant operation means that the VDS 200Q10.x can source and sink current using a programmed voltage in both polarities.



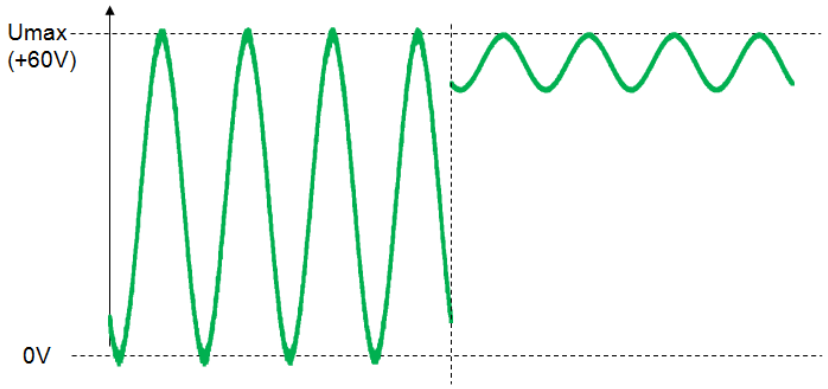
Please note that if a DUT has an input capacitance, this will be discharged through the VDS if the VDS voltage is reduced below that stored in the capacitor, i.e. the DUT will be completely discharged if the voltage is set to zero.

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 200Q10.x 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 200Q10.x series. 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 200Q10.x is not used in the negative voltage range when a PFS 200N, LD 200N or UCS200N are connected.

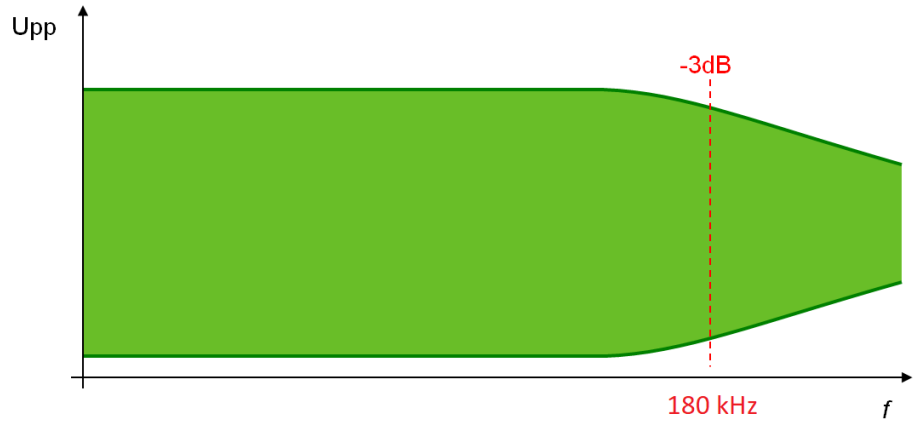
CAUTION:
Producing negative voltages with the VDS 200Q10.x will damage the PFS 200N, LD 200N and UCS 200N!
The user must disconnect these generators before performing tests that require negative voltages!

The maximum current that can be fed back from the DUT is equal to the maximum rating of the amplifier. The VDS 200Q10.x can source 10A permanently, or 10A accept 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. The VDS 200Q10.x can provide up to the maximum current capability of the unit from near zero volts up to the full 60V.

As mentioned above, there is no restriction of using the full voltage range over the entire frequency bandwidth. As bandwidth is typically defined at the -3dB point, there will be some reduction at higher frequencies. You are free to correct for this, if necessary, but exceeding the maximum rated bandwidth of the amplifier should be avoided, and one must never exceed the 10V control signal.



4. Technical Data

4.1. Test level

Voltage for VDS 200Q10.x		U = -60 to +60 V ± 2% with 0.1 V steps setting
Output resolution Front panel setting		internal ADC 12 Bit: approx. 0.24 V at range -60…+60 V
Output resolution AutoWave setting		AutoWave ADC 16 Bit: Resolution < 1 mV
Current	VDS 200Q10.x-100	I = 0 A – ± 10 A ± 5% max. 10 A
	VDS 200Q10.x-120	I = 0 A – ± 10 A ± 5% max. 10 A
	VDS 200Q10.x-230	I = 0 A – ± 10 A ± 5% max. 10 A
		Independent of programmed voltage and voltage range.
Bandwidth (-3dB)		DC-180 kHz
Rise Time		Typ. <3us (High Freq.), <10 us (Standard)
Source impedance		Zi = < 10 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} = 0...Imax
Voltage ripple U_r		U_r = < 0.2 V peak to peak
Pulses		as per test routines

4.2. 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

4.3. 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 – 150 kHz
External trigger input	5 – 15 V TTL signal (BNC connector)
CRO trigger output	5 V TTL signal (BNC connector)

4.4. Interfaces

Serial interface USB	Baudrate: Setting; 1,200 to 19,200 Baud
Parallel interface	IEEE; addresses 1 - 30
FRAME BUS	EM Test internal communication interface for certain generators

4.5. General

Dimensions	Model	HU Unit	Dimension H x W x D	Weight
	VDS 200Q10-x	6HU	28.9 x 53.5 x 50 cm	approx. 37 kg
	VDS 200Q10.1-x	6HU	28.9 x 53.5 x 50 cm	approx. 37 kg

Supply voltage, protection and input current

Device	Mains Phases	Supply Voltage U_{eff}	Primary Current I_{eff}	Fuse	
VDS 200Q10.x-100	1	100 V ±10%	10.3 A	16 AT / 115V	(5 x 20 mm)
VDS 200Q10.x-120	1	120 V ±10%	8.6 A	10 AT / 115V	(5 x 20 mm)
VDS 200Q10.x-230	1	230 V ±10%	4.3 A	6.3 AT / 230V	(5 x 20 mm)

4.6. Environmental conditions

Temperature range:	Operation at +10 to +40°C Storage at -10 to +60°C
Humidity:	30 to 75% (non condensing)
Pressure:	860 to 1060 hPa
Protection Class:	IP20

5. Maintenance

5.1. General

The generator is absolutely maintenance-free by using a solid state semiconductor switch to generate the fast transients.

5.2. 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, PFS, 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.

5.3. Test set-up with software iso.control

By using iso.control software:

- Connect the VDS 200Q10.x to a computer running iso.control via GPIB or USB

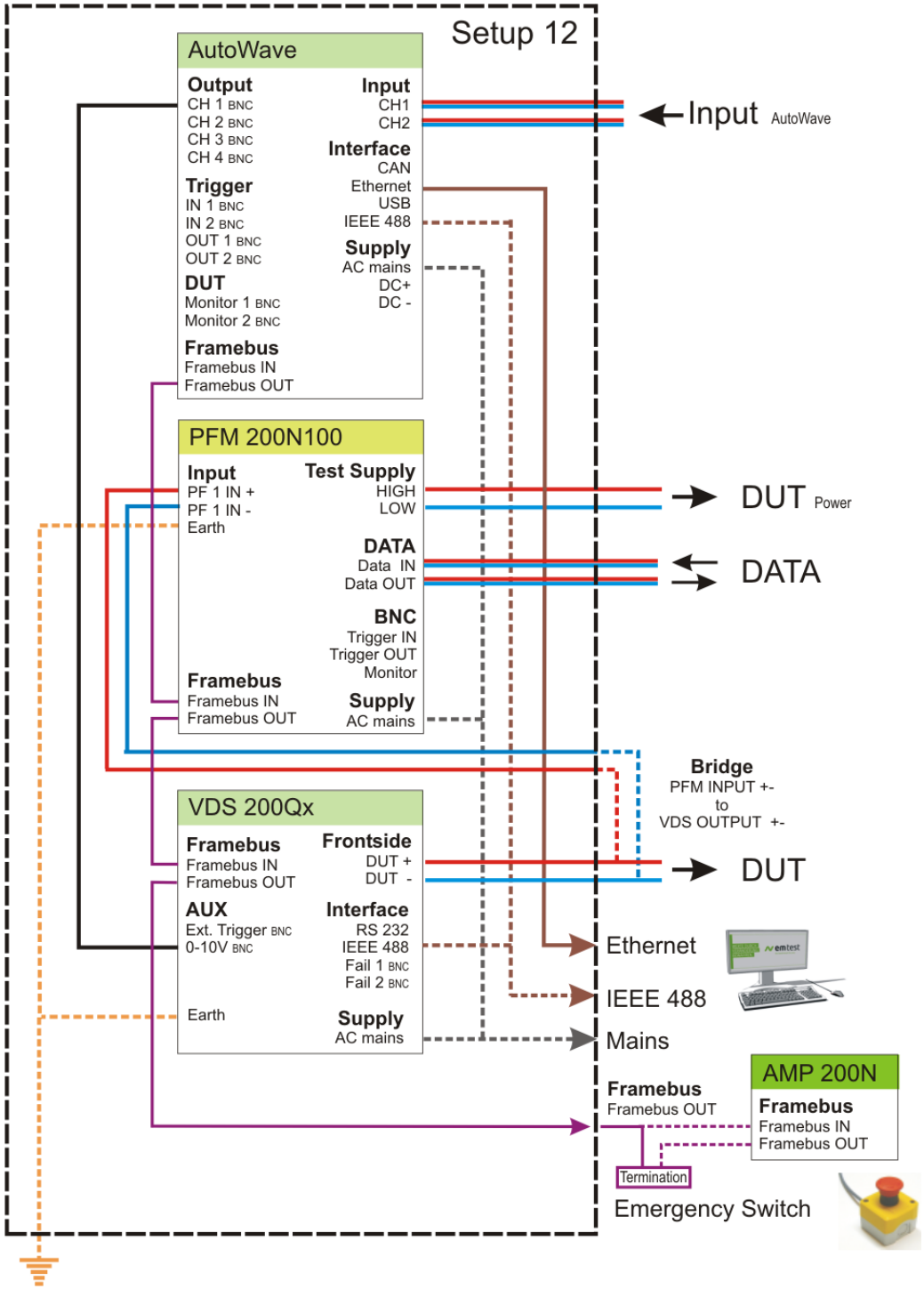
By using autowave.control software

- Connect the VDS 200Q10.x to a computer running autowave.control via GIPB or USB

5.4. Example Test setup with VDS 200Q10.x, AutoWave and PFM 200N100

Setup 12
example with:

Rack
AutoWave
PFM 200N100
VDS 200Q10.x

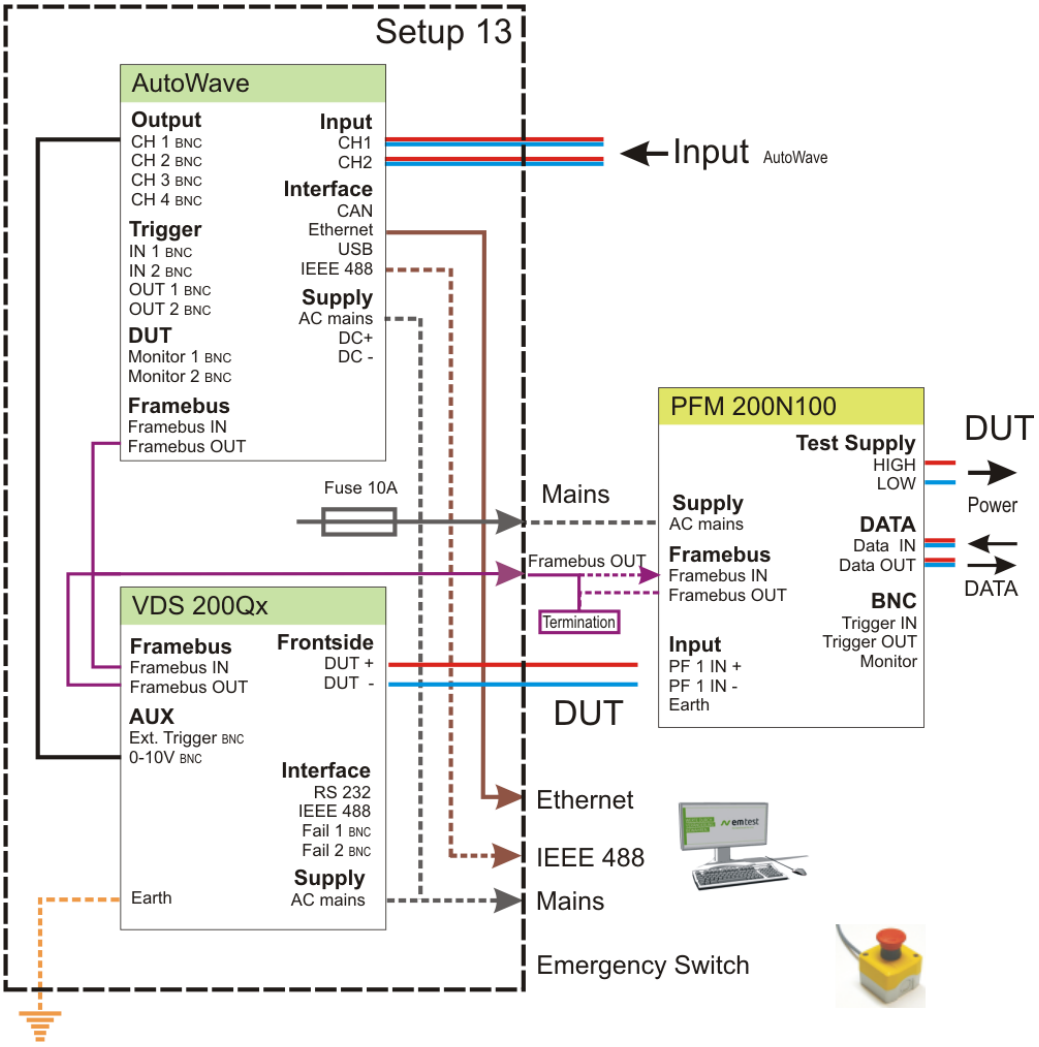


5.5. Example Test setup with AutoWave and VDS 200Q10.x

Setup 13
example with:

Rack
AutoWave
VDS 200Q10.x

Exernal:
PFM 200N100



5.6. Calibration and Verification

5.6.1. 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

5.6.2. 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.

5.6.3. 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.

5.6.4. 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.

6. Delivery Groups

6.1. Basic equipment VDS 200Q10.x

- VDS 200Q10.x
- 1-phase power mains cable (2m)
- EUT supply cables 32A (red/black 1each, 2 m)
- Safety cables 32A (red/black 1each, 0.5 m) connection to PFS 200N100.x
- Signal control cable (0.15m), BNC Jumper Cable for CH1 to VDS 200Q
- Framebus cable if not already built in the Rack
- Framebus terminator, Framebus Sub-D plug 15 pole, No 101732
- USB cable (communication with PC) or
- IEEE Cable, 4m
- Signal control cable, 2 m BNC cable connection

Identical accessory parts are delivered only once if several devices are ordered. The delivered packing list is in each case valid for the delivery.

6.2. 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

6.3. 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

7. Appendix

7.1. Declaration of CE-Conformity

7.1.1. Declaration of CE-Conformity VDS 200Q10

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 200Q10

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.

	European representative	Manufacturer
	AMETEK CTS Germany GmbH Lünenerstr. 211 D 59174 Kamen Tel: +49 (0) 2307 / 26070-0 Fax: +49 (0)2307 / 17050	AMETEK CTS GmbH Sternenhofstr. 15 CH 4153 Reinach Tel: +41 61-7179191 Fax: +41 61-7179199
By	A. Gerstner General manager	A. Burger Business Manager Conducted EMC
Place	Kamen, Germany	Reinach BL, Switzerland
Date	1. July 2017	1. July 2017

7.1.2. Declaration of CE-Conformity VDS 200Q10.1

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 200Q10.1

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 Business Manager Conducted EMC
Place	Reinach BL, Switzerland
Date	1. February 2021