Modal Excitation Systems

Modal Excitation System Type 3624

- Type 4824 — Modal Exciter
- Type 2732 — Power Amplifier (120 VA)
- UA-1598 — Three Push/Pull Steel Stingers

Modal Excitation System Type 3625

- Type 4825 — Modal Exciter
- Type 2720 — Power Amplifier (500 VA)*
- UA-1598 — Three Push/Pull Steel Stingers

Modal Excitation System Type 3626

- Type 4826 — Modal Exciter
- Type 2721 — Power Amplifier (1250 VA)
- UA-1598 — Three Push/Pull Steel Stingers

* For 230 V mains supply only. For 100 V and 120 V mains supply, please use Type 2721.

Modal Excitation System Type 3627

- Type 4827 — Modal Exciter
- Type 2721 — Power Amplifier (1250 VA)
- Type 1056 — DC Static Centering Unit
- Type 2830 — Field Power Supply
- UA-1599 — Three Push/Pull Steel Stingers

Modal Excitation System Type 3628

- Type 4828 — Modal Exciter
- Type 2721 — Power Amplifier (1250 VA)
- Type 1056 — DC Static Centering Unit
- Type 2830 — Field Power Supply
- UA-1599 — Three Push/Pull Steel Stingers

Modal Exciters

Modal Exciter Type 4824
Includes the following accessories:

- AQ-0649 — Cable with two 4-pin Neutrik™ speakON™ connectors, length 5 m (16.4 ft)
- KC-1007 — Trunnion
- UA-1612 — Three Adaptors M6 to 10–32 UNF

Modal Exciter Type 4825
Includes the following accessories:

- AQ-0649 — Cable with two 4-pin Neutrik™ speakON™ connectors, length 5 m (16.4 ft)
- KC-1007 — Trunnion
- UH-1035 — 200 N Blower for Type 4825
- AF-1101 — Air Hose for UH-1035, length 5 m (16.4 ft)
- UA-1612 — Three Adaptors M6 to 10–32 UNF

In addition to modal exciters, the following Brüel & Kjær measurement exciters are also available.

Type 4808	112 N (25 lbf) sine peak, 187 N (42 lbf) with forced air cooling
Type 4809	45 N (10 lbf) sine peak, 60 N (13.5 lbf) with forced air cooling
Type 4810	10 N (2.25 lbf) sine peak

Modal Exciter Type 4826
Includes the following accessories:

- AQ-0659 — Cable with two 8-pin Neutrik™ speakON™ connectors, length 5 m (16.4 ft)
- KC-1007 — Trunnion
- UH-1036-004 — 400 N Blower for Type 4826
- AF-1103 — Air Hose for UH-1035, length 5 m (16.4 ft)
- UA-1612 — Three Adaptors M6 to 10–32 UNF

Modal Exciter Types 4827 and 4828
Both include the following accessories:

- KC-1008 — Trunnion
- UH-1036-001 — 1000 N Blower
- AF-1103 — Air Hose for UH-1036, length 5 m (16.4 ft)
- UA-1614 — Three Adaptors M8 to 10–32 UNF
- UA-2039 — Three M8 to M6 thread inserts

IMPORTANT ASPECTS WHEN CHOOSING MODAL EXCITER SYSTEMS

Force Rating Determination

When choosing a modal exciter for the testing of a specific structure, two types of mass definitions come into play: static mass and dynamic mass. Static mass is defined as the weight of the structure under test. Dynamic mass (sometimes called apparent mass) is derived from a mobility measurement and is defined as F(f)/a(f), where F(f) is the force as a function of frequency and a(f) is the acceleration as a function of frequency.

Static mass is related to the rigid body modes of a structure while dynamic mass is related to the elastic modes. Therefore, the relationship between recommended force rating and the static mass of the structure used in this guide can only be taken as a rule of thumb.

The dynamic mass and the residual noise in the response channels are generally the determining factors when choosing optimum force rating, but the dynamic mass is usually unknown unless a finite element model is available!

If the dynamic mass is known, the formula F = m × a can be used to get a better estimation of the force rating needed. F is the required force rating, m is the dynamic mass (at the frequencies of interest) and a is the required acceleration level (at the same frequencies of interest). The required acceleration level a must be at or above the residual noise in the response channels. However, since damping determines the response amplitude at resonances, the stated formula should be seen only as a tool to help determine the required force rating.

Multi-exciter Setup

In a multi-exciter MIMO (Multiple Input Multiple Output) setup, the stated relationship between recommended force rating and static mass of the test structure no longer applies as a rule of thumb.

Strong non-linear behaviour of the test object (suggesting distributed low-force inputs), repeated roots and/or a very large test object, normally implies that the number of input locations must be increased to achieve reliable modal parameter extraction. In such applications, several modal exciters with a force rating of only 100, 200 or 400 N are often employed to overcome these problems even for large aircraft. Prior knowledge, pretest analysis or a 'trial-and-error' approach is typically needed to establish the optimum number of modal exciters in such a setup. The examples refer to single exciter use.

Further information

Please notice that this configuration guide should be used in conjunction with product data sheets available for the different products. For additional information please contact us.

Hottinger Brüel & Kjær A/S
DK-2850 Nærum · Denmark
Telephone: +45 77 41 20 00
www.hbkworld.com · info@hbkworld.com
Local representatives and service organizations worldwide

BG 1483-14

HBK
HOTTINGER BRÜEL & KJÆR

Modal Exciter Configuration Guide

HBK OFFERS A WIDE RANGE OF MODAL AND MEASUREMENT EXCITERS AND ACCESSORIES TO MEET YOUR TESTING NEEDS.

Excitation Systems and Stands

START

SIZE OF STRUCTURE TO BE EXCITED

LARGE

SMALL/MEDIUM

MODAL EXCITATION SYSTEM TYPE 3624

Small structures, for example, small engines, power/drive train components and sub-structures.
Force rating: 100 N (22.5 lbf) sine peak
Typical mass: < 200 kg (441 lb)

MODAL EXCITATION SYSTEM TYPE 3625

Small/medium structures, for example, passenger car body-in-white and aeroplane landing gear.
Force rating: 200 N (45 lbf) sine peak
Typical mass: < 500 kg (1102 lb)

MODAL EXCITATION SYSTEM TYPE 3626

Medium structures, for example, truck and bus chassis, drive trains and medium size machine foundations.
Force rating: 400 N (90 lbf) sine peak
Typical mass: < 1000 kg (2205 lb)

MOVEABLE AND QUICK SETUP REQUIRED?

YES

NO

ELEVATION HEIGHT REQUIRED

< 1.2 m (4.1 ft)

< 1.6 m (5.4 ft)

UA 1607

Lateral Modal Exciter Stand

UA 1608

Lateral Modal Exciter Stand

MODAL EXCITATION SYSTEM TYPE 3627

Large structures, for example, earthmoving equipment, aircraft wings, escalators.

Force rating: 650 N (146 lbf) sine peak
Typical mass: < 5000 kg (11,023 lb)

MODAL EXCITATION SYSTEM TYPE 3628

Large structures, for example, trimmed satellites, aeroplane substructures, engines, turbines, ships and small bridges.

Force rating: 1000 N (225 lbf) sine peak
Typical mass: < 10,000 kg (22,046 lb)

Stingers and Tension Wire

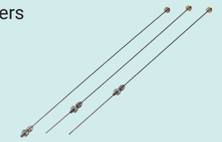
PUSH/PULL STINGER WITH VARIABLE LENGTH NEEDED?

NO

YES

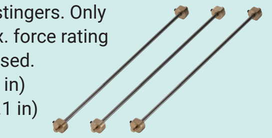
UA 1598

Three push/pull steel stingers included in the systems.
Length: 500 mm (19.7 in)
Diameter: 2.5 mm (0.1 in)



UA 1596

Five push/pull steel stingers. Only recommended if max. force rating of modal exciter is used.
Length: 200 mm (7.9 in)
Diameter: 2.5 mm (0.1 in)



CAN TENSION WIRE BE USED?[1]

YES

NO

UA 1600

One tension wire
Length: 5000 mm (179 in)
Diameter: 0.75 mm (0.03 in)

PERFORM MODAL EXCITATION IN CONFINED SPACES?

YES

NO

TYPE 1056[2]

DC Static Centring Unit

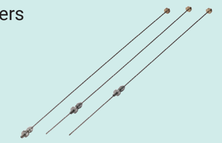
PUSH/PULL STINGER WITH VARIABLE LENGTH NEEDED?

NO

YES

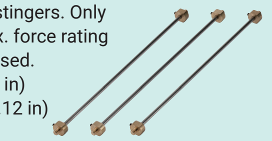
UA 1599

Three push/pull steel stingers included in the systems.
Length: 500 mm (19.7 in)
Diameter: 3.0 mm (0.12 in)



UA 1597

Five push/pull steel stingers. Only recommended if max. force rating of modal exciter is used.
Length: 200 mm (7.9 in)
Diameter: 3.0 mm (0.12 in)



Input Transducers

PREFERENCE FOR FORCE TRANSDUCER OR IMPEDANCE HEAD

FORCE TRANSDUCER

IMPEDANCE HEAD

TYPE 8001[3]

Impedance Head
Range full scale:
+2000 N to −300 N
(450 lbf to −67 lbf)

PREFERENCE FOR CHARGE (PE) OR DELTATRON® (IEPE/CCLD)

CHARGE (PE)

DELTATRON (IEPE/CCLD)

TYPE 8230

Force Transducer
Range full scale:
+45 N to −45 N
(+10 lbf to −10 lbf)

TYPE 8230-001

Force Transducer
Range full scale:
+220 N to −220 N
(+50 lbf to −50 lbf)

TYPE 8230-002

Force Transducer
Range full scale:
+2200 N to −2200 N
(+500 lbf to −500 lbf)

TYPE 8230-003

Force Transducer
Range full scale:
+22 kN to −2.2 kN
(+5000 lbf to −500 lbf)

TYPE 8230-C-003

Force Transducer
Range full scale:
+22 kN to −2.2 kN
(5000 lbf to −500 lbf)

TYPE 8231-C

Force Transducer
Range full scale:
+110 kN to −22 kN
(25,000 lbf to −500 lbf)

FINISH

Footnotes:

1. Excitation via tension wire provides for the highest possible force measurement accuracy but requires that the structure under test can tolerate a constant pull without being displaced towards the modal exciter. It also requires that excitation is applied only at low frequencies (typically < 400 Hz), at low force levels (typically < 200 N) and with the shortest possible length of wire between modal exciter and structure under test.

2. Used in conjunction with Types 3624, 3625 and 3626. DC Static Centring Unit Type 1056 provides for electrical pre-tensioning (no need for a pre-tensioning spring), making it possible to utilize tension wire stinger UA 1600 in setups that would otherwise only allow for a push/pull stinger.

3. An impedance head provides for the highest accuracy of the driving point frequency response function measurement as there is a perfect co-linear relationship between force and acceleration measurement. Note that the use of the impedance head requires that the dynamic mass of the structure under test must be less than 1.5 kg for force measurement errors less than 10%. Structures with a dynamic weight of more than 1.5 kg should be instrumented with separate force transducers and accelerometers.