

The logo for GREWUS, featuring the company name in a stylized, rounded, white font with a grey outline, set against a blue circular background with a pink border.

HAPTIC SOLUTION PROVIDER

ROADMAP

2007...

FOUNDATION

WE ARE YOUR
COLLEAGUES FROM
THE ACOUSTIC
DEPARTMENT

ACOUSTIC
TECHNOLOGY

STARTED WITH
5 EMPLOYEES
IN HAMBURG

ISO 9001
IATF 16949
ISO 14001

TIER 1

CUSTOMIZED

PARTNER
BESTAR

PART OF THE
BESTAR HOLDING
WITH MORE THAN
1000 EMPLOYEES
AND OVER SIX OWN
PRODUCTIONS



GREWUS GMBH

**GLOBAL COMPETENCE CENTER
FOR ACOUSTICS AND HAPTICS**

Hamburg, Germany

BESTAR TECHNOLOGIES INC.

Chicago, United States

BESTAR HOLDING

BESTAR SENSORS

ANYI TECHNOLOGY

AUDIO UNLIMITED INCORPORATION

SHYCH ADVANCED MATERIAL

Changzhou, P.R. China

BESTAR TECHNOLOGY

Shenzhen, P.R. China

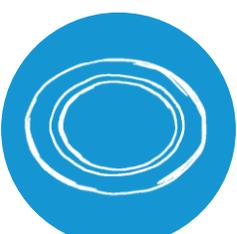
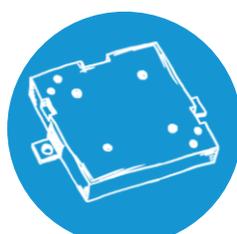
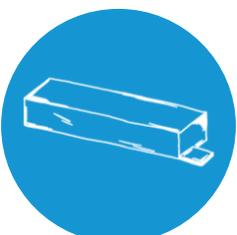
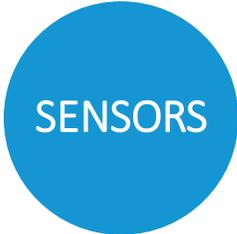
BESTAR TECHNOLOGY

Suwon-Si, South Korea

BESTAR TECHNOLOGY

Osaka, Japan

ELECTROMAGNETIC AND PIEZOELECTRIC TECHNOLOGIES



2015...

HAPTIC
TECHNOLOGIES

START OF THE
FIRST **EXCITER**
ACOUSTIC
PROJECTS

30 MIO.
PIECES A
YEAR

2016...

HAPTIC TECHNOLOGIES

LRA /
ERM

SINGLE AND
MULTILAYER
PIEZO

EXCITER

VOICE COIL

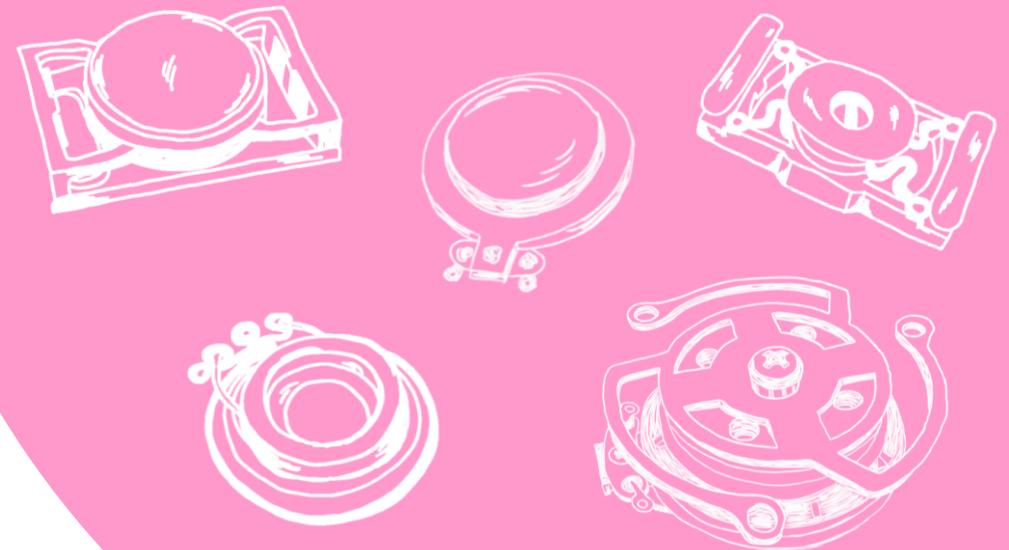
DUAL USE:
HAPTIC AND
ACOUSTIC IN
ONE DEVICE

FREE TO MODULE
THE FREQUENCY AS
WELL AS AMPLITUDE
THROUGHOUT THE
WHOLE FREQUENCY
RANGE

WEATHERPROOF,
AS NO SOUND
OUTLET OPENING
DUE TO THE
CONSTRUCTION
IS REQUIRED

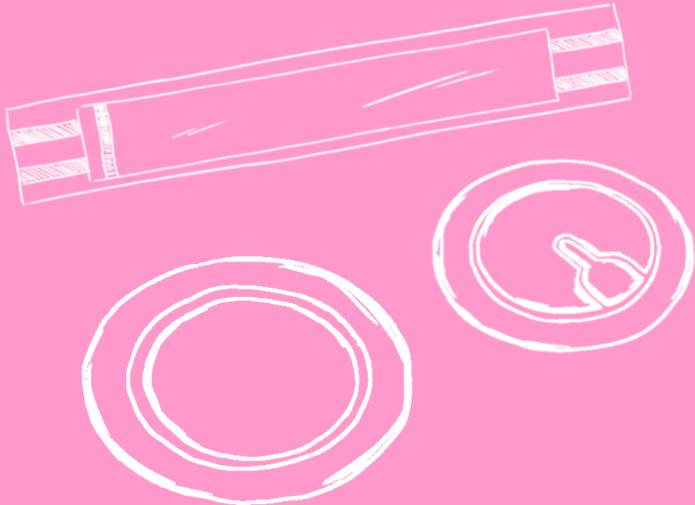
THE EXCITER THE MUSCLEMAN FOR COMPLETE USER INTERFACES

(SUSPENDED SYSTEM)



PIEZOS DUAL USE POSSIBILITIES: SENSORS OR ACTUATORS

(ATTACHED SYSTEM)



GLOBAL OR
LOCAL PRECISE
HAPTIC
FEEDBACK

MECHANICAL
CLICK-FEELING
VIA ELECTRONIC
COMPONENT

WIDE FREQUENCY
RESPONSE, SILENT
OPERATION, AND
ABILITY TO CREATE
HIGH DEFINITION
HAPTICS EFFECTS

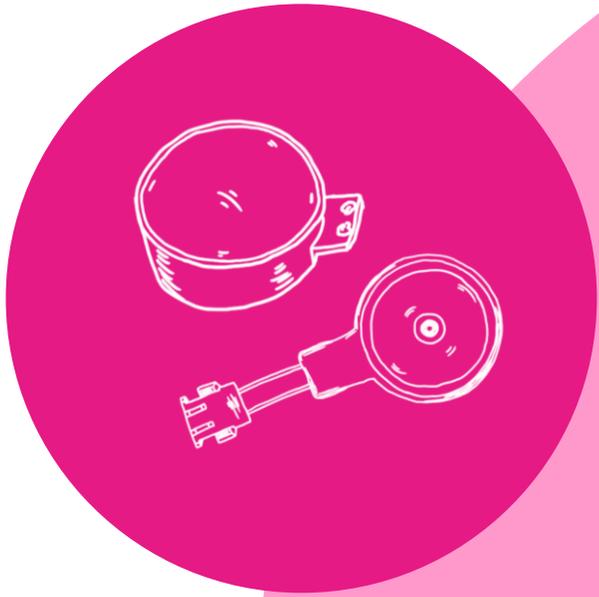
MAXIMUM
POWER WHILE
MAINTAINING
LOWEST WEIGHT

GLOBAL FEEDBACK,
HIGH ACCELERATION,
FAST RESPONSE TIME
AND EASY CONTROL

THE VOICE COIL BROADER FREQUENCY AND HIGHER DEFINITION HAPTIC RESPONSE

(ATTACHED SYSTEM)

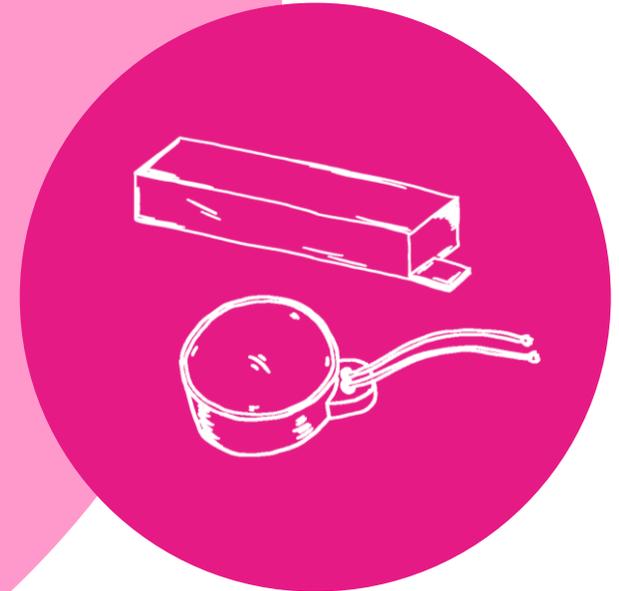




LRA / ERM

HAPTIC FEEDBACK FOR HANDHELD DEVICES AND SMALLER APPLICATIONS PROVIDED BY MOVING MOTORES

(SUSPENDED SYSTEM)



2018...

COOPERATIONS

GLOBAL HAPTIC
COMPETENCE
CENTER AND
HAPTIC SOLUTION
PROVIDER

WE MAKE
YOUR IDEAS
TACTILE

HAPTIC COOPERATIONS AND MEMBERSHIPS

LEONHARD
KURZ /
POLY IC
DECOR & SENSOR

HAPTIC
INDUSTRY
FORUM
HAPTICS
STANDARDS

UNIVERSITIES
UNIVERSITY OF NANJING
SDU DENMARK
TUHH HAMBURG
TU DRESDEN
HTW DRESDEN

CIRRUS
LOGIC
DRIVER CHIPS

CYPRESS /
INFINEON
TOUCHSENSING

KUNSTSTOFF-
INSTITUT
LÜDENSCHIED
WORKSHOPS

TACTOTEK
SMART
SURFACES

DEUTSCHES
FLACHDISPLAY-
FORUM
DISPLAYS & HMI's

2021...

HAPTIC GOALS

GREWUS
HAPTIC
INTENSITY
VALUE
(GHIV)

START MASS
PRODUCTION
E-CHARGE
STATION DISPLAY
WITH EXCITER

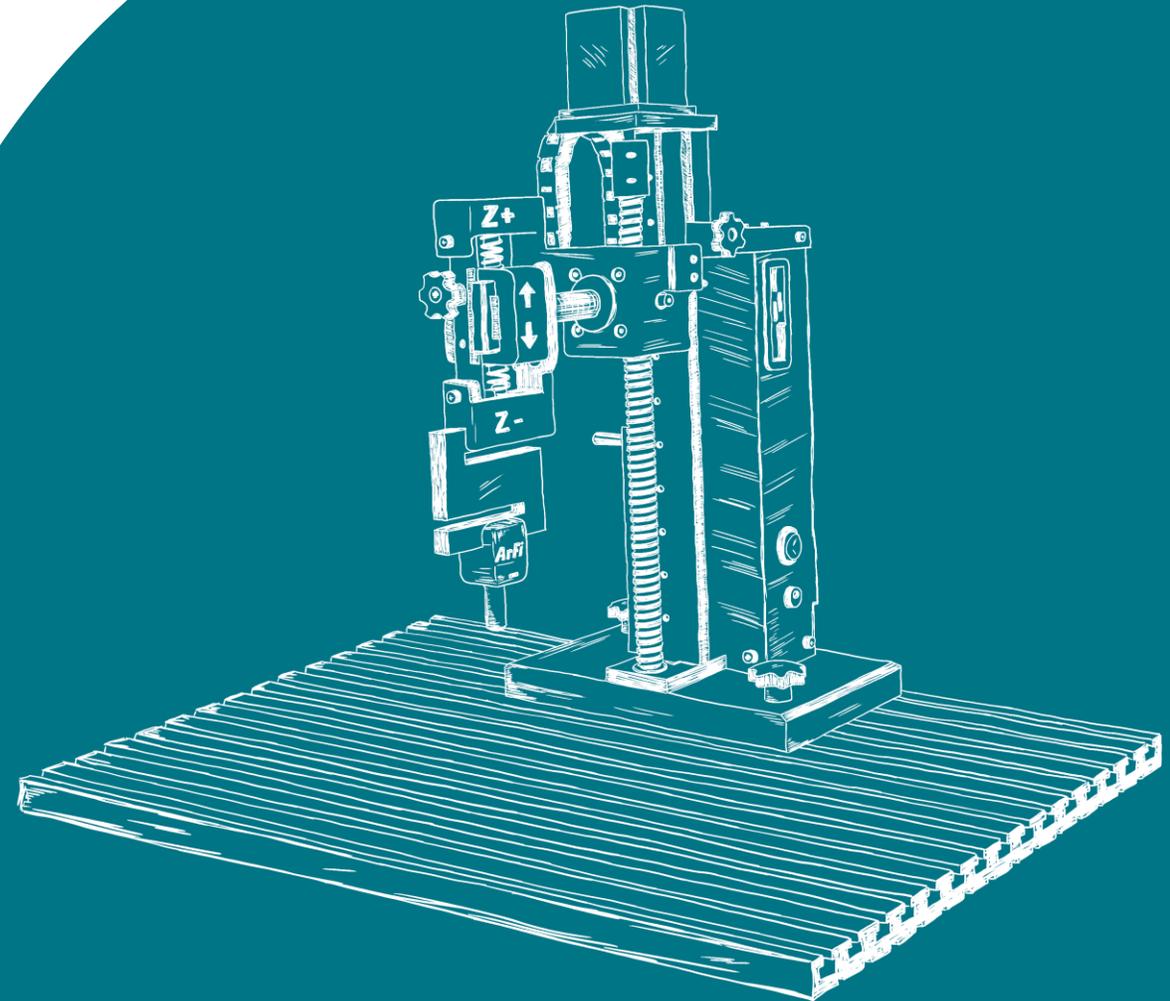
ARTIFICIAL
FINGER
(ArFi)

HAPTIC
EVALUATION
BOARD
(HEBO)

ARTIFICIAL FINGER EVALUATION, SPECIFICATION AND QUANTIFICATION OF HAPTICS

NOT ONLY ACTUATORS SPECS, BUT THE COMPLETE
APPLICATION / SURFACE IS CONSIDERED

STAND-ALONE
DEVICE WITH
ITS OWN
DISPLAY



SENSOR 1
UNDER THE
FINGER, WITH
DIFFERENT
SHORE-
HARDNESS

SENSOR 2
ON THE
SURFACE

MICROPHONE
ACOUSTIC
MEASUREMENT

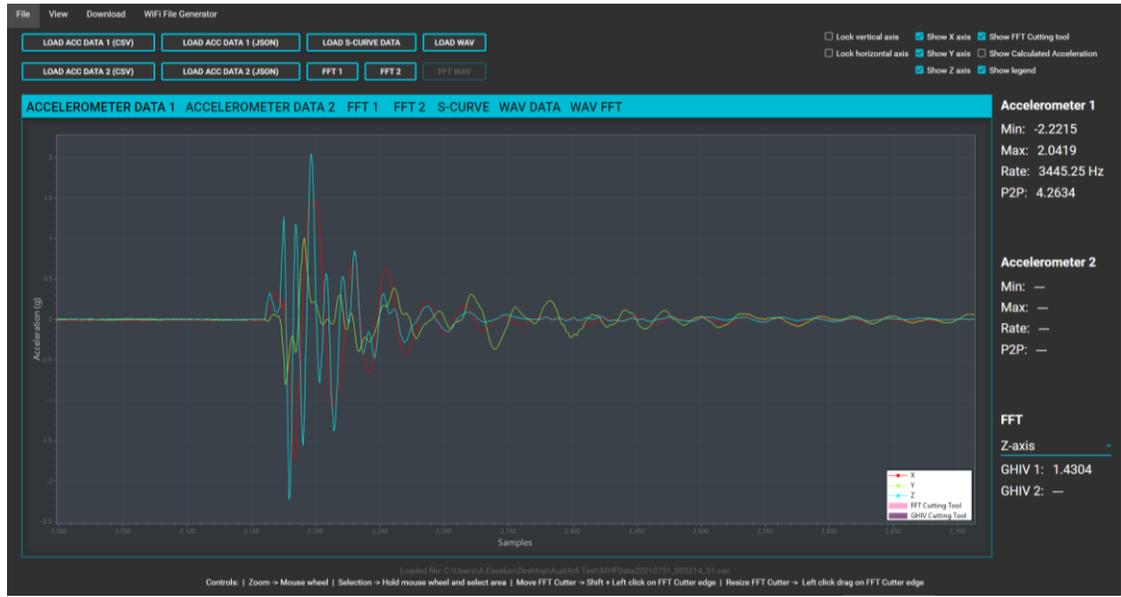
USER INTERFACE

The user interface is divided into two main sections: Motor Control and Procedures.

Motor Control: Features a vertical position scale from 0 to 100 mm, with a current reading of 10.00 mm. A force dial is set to 0 N, with a maximum force of 5 N. Controls include HOME, UP, DOWN, SAVE POSITION, GO TO SAVED POSITION, UP MM, DOWN MM, and a slider for Adjust Max Touch Force (N).

Procedures: Shows the current session as SmartHaptics. Available actions include CALIBRATE LOAD CELL / TARE, FIND SURFACE, GO TO MAX FORCE, GO TO SURFACE TOUCH, S-CURVE, and various AUTO and MANUAL MEASURE ACTIVE HAPTIC options for SOLO and DUAL sensors. Includes LATEST DATA, EXPERT MODE, and a prominent EMERGENCY STOP button.

EXAMPLE MEASUREMENT



SWITCHING POINT
MEASUREMENT OF
ACTIVE HAPTICS, WHEN
DOES THE HAPTIC TRIGGER
-> STATIC & DYNAMIC
FORCE TRIGGERING

**VERTICAL AND
HORIZONTAL
MEASUREMENTS
POSSIBLE**

ArFi
ARTIFICIAL FINGER

Powered by **GREWUS**

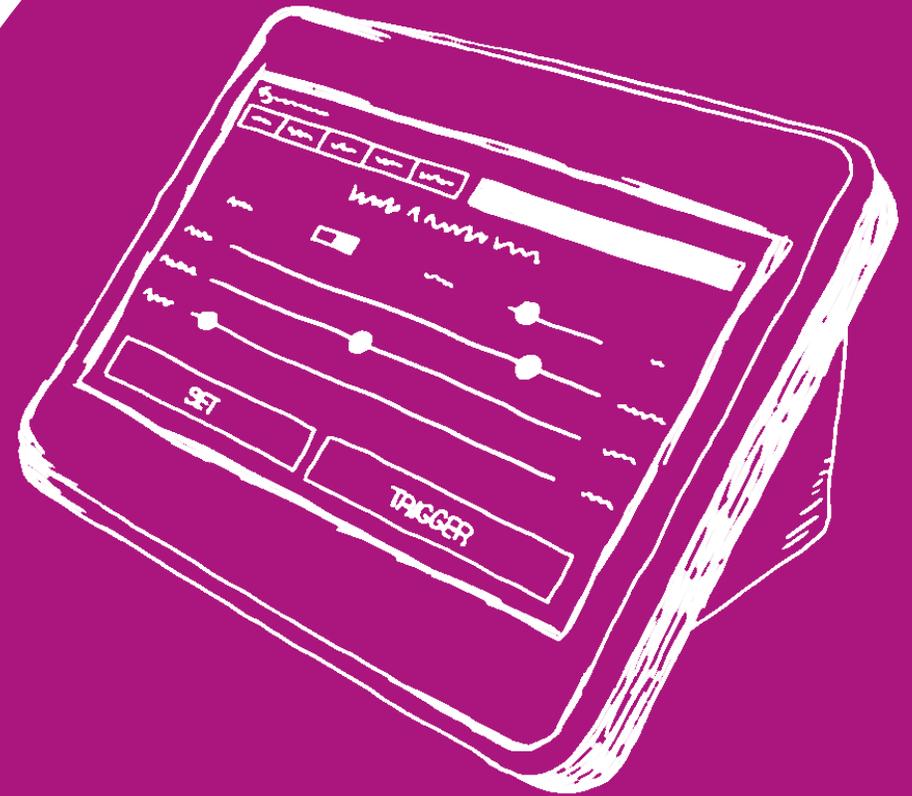
**ACCELERATION
MEASUREMENT
WITHOUT AND WITH
FORCE (UP TO 10N)
IN X-Y-Z-AXIS**

**CONSIDERING THE GHIV
GREWUS HAPTIC
INTENSITY VALUE /
HUMAN PERCEPTION**

**S-CURVE
PASSIVE HAPTICS /
MECHANICAL SWITCHES
CAN BE MEASURED**

HAPTIC EVALUATION BOARD FOR ELECTROMAGNETIC ACTUATORS

CONTROL
OF ELECTRO-
MAGNETIC
ACTUATORS
MADE EASY



**PLUG AND
PLAY SOLUTION**
TOUCHDISPLAY, FOUR
READY ACTUATORS,
CHANGEABLE HAPTIC
PARAMETERS

**DRIVING
COMPATIBLE
ACTUATORS:**
EXCITER,
LRA's, ERM's,
SOLENOIDS,
VOICE COILS

HEBO

HAPTIC EVALUATION BOARD

Powered by 

HAPTIC PATTERN
LOAD, EDIT AND
SAVE WAVEFORMS,
TUNE PATTERNS

SENSING
DIGITAL TRIGGER
INPUTS / GPIO's, ADJUST
TOUCH AND / OR RELEASE,
SLIDER FUNCTION

RAPID PROTOTYPING
QUICK CONNECTIVITY
AND A NICE USER
INTERFACE PUTS THE
FOCUS ON THE HAPTIC
AND NOT THE SETUP

2023...

TIER 1
HAPTICS IN
TOUCHSCREENS,
TOUCHPADS,
STEERING
WHEELS AND ON
CURVED SURFACES
OR LARGER CENTER
CONSOLES

TIER 2
LOCALIZED
HAPTICS ON
EXTRAORDINARY
SURFACES (LEATHER,
FABRIC, WOOD)

REQUIREMENTS

**NEXT
GENERATION
EXCITER &
VOICE COIL
INCL. FORCE
SENSING**

**MULTILAYER
PIEZO
LEAD FREE**

**COCKPIT OF
THE FUTURE**

THANK YOU!



Elisa Santella

(Managing Director)

elisa.santella@grewus.de

+49 40 539 32 64 25

GREWUS GmbH

Langenhorner Chaussee 40

22335 Hamburg, Germany

www.grewus.de