



Features

- Multi-channel front end for the BrakeOBSERVER system
- Ignition interface (starting and ending the BrakeOBSERVER system via ignition or via switch)
- MMF III.0 front end supplies power for miniature displays HCP II / HCP
- Temperature-controlled fan
- Battery-buffered power in the case of power interruptions
- Docking station for the Panasonic toughbook CF-33

Interfaces for connecting

- 12 Line /ICP sensors with individual level configuration
- 6 sensors (strain gauges) for measuring brake pressure, humidity, vehicle acceleration, measuring bridges etc. (differential inputs)
- 6 temperature sensors K type and RTD (PT100, PT1000)
- 2 pulse sensors
- CAN, OBD-2 or FlexRay
- GPS receiver CDG I.1
- HEAD Control Panel (HCP II / HCP)
- 2 HEADlab modules:
 - labT6 (temperature sensors)
 - labSG6 (Strain Gauges)
 - labDX (CAN/OBD-2/FlexRay, pulse sensors, artificial heads)
 - labM6/labM6-V1 (condenser microphones)

- labV6HD (line/ICP sensors via inputs with high-dynamic range)
- labV12/labV12-V1/labV12-V2 (line/ICP sensors - no Dual-Link)
 - HEADlink 1: Data acquisition triggered by the BrakeOBSERVER software
 - HEADlink 2: continuous data acquisition without triggers
- labCF6 (charge sensors)
- labHMS (artificial heads)

For using HEADlab modules together with MMF III.0 or MMF III.0-V1, the BrakeOBSERVER software Tool Pack 01 is required.

BrakeOBSERVER system

- The BrakeOBSERVER system consists of
 - the front end MMF III.0 including docking station und Panasonic toughbook CF-33 or the front end MMF III.0-V1 (for using the variant MMF III.0-V1, a customer's computer is needed. Information about the system requirements are available in the BrakeOBSERVER data sheet)
 - the BrakeOBSERVER software
 - as well as further hardware and software options

DATA SHEET

MMF III.0 (Code 3313)

Multi-channel front end (BrakeOBSERVER front end) with docking station for toughbook CF-33

- MMF III.0-V1 (Code 3313-V1) Variant (without docking station)

Overview

The multi-channel front end MMF III.0 is part of the BrakeOBSERVER system for the development, the sound optimization and the acoustical quality control of brake systems.

MMF III.0 is equipped for acquiring the signals necessary for brake examinations and offers customizable interfaces for connecting sensors and other equipment.

After docking the toughbook Panasonic CF-33, users only need to establish the USB connection to get a perfectly matched system, which automatically starts via the ignition switch of the car.

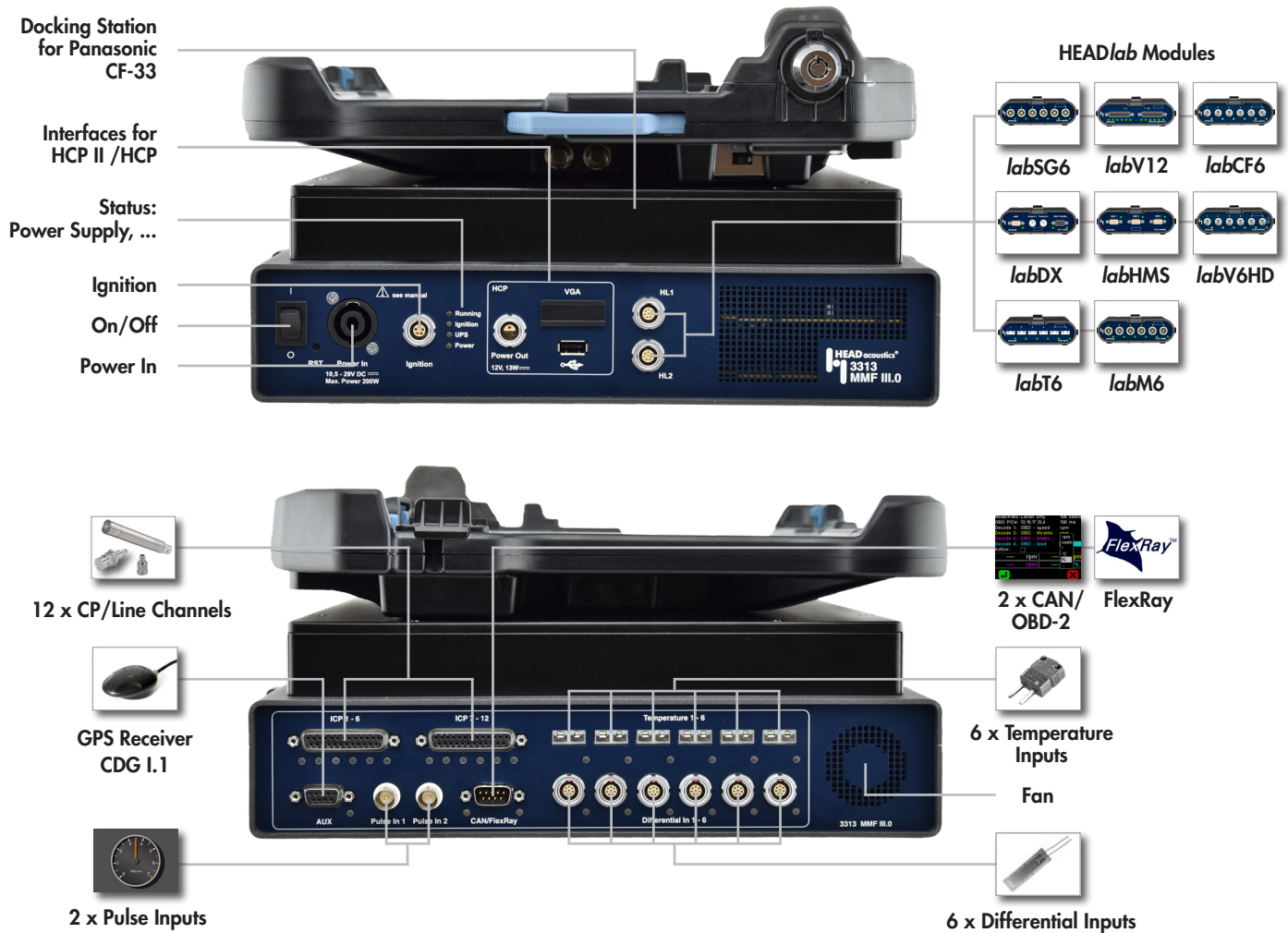
In the case of power interruptions, the built-in battery of the front end also powers the miniature displays HCP II / HCP and any connected sensors. The recommended toughbook has its own battery.

Variant MMF III.0-V1



- The variant MMF III.0-V1 is identical to the front end MMF III.0 but has no docking station. Instead it provides a construction for mounting and supplying a computer
- The HCP II / HCP must be connected to a VGA port of the computer, because the MMF III.0-V1 has no VGA interface
- In mobile operation, the computer must be supplied by its own battery or via MMF III.0-V1

Front and rear side MMF III.0



Scope of supply

- MMF III.0 (Code 3313)
Multi-channel front end with docking station for CF-33
or:
MMF III.0-V1 (Code 3313-V1)
Variant: Multi-channel front end without docking station
 - CUSB I.1 (Code 9860-1)
USB-Kabel MMF III.0-V1 ↔ PC, 1 m (39.3")
- CSO II.5 (Code 9853-5)
Power supply cable for MMF III.0/ MMF III.0-V1, 5 m (197")
- CLO V.5 (Code 9854-5)
Ignition cable, 5 m
- HSC VI.5 (Code 9875)
Carrying case for MMF III
- HCP II (Code 1981)
HEAD Control Panel 10"
 - HCP-SM (Code 1982)
Suction Mount for HCP II
- HCP (Code 1980)
HEAD Control Panel 7"
- CDG I.1 (Code 3796)
GPS receiver
- Breakout cables for audio inputs:
 - CDB X.1 (Code 3792)
Breakout cable D-Sub 25-pin ↔ 6 x BNC female, 1 m (39.3")
 - CDB II.1 (Code 3556)
Breakout cable D-Sub 25-pin ↔ 6 x BNC male, 1 m (39.3")
 - CDM X.03 (Code 3793-03)
Breakout cable D-Sub 25-pin ↔ 6 x Microdot, 30 cm (11.8")
- Cable adapter for CAN/OBD-2 / FlexRay input:
 - CMD 0.12 (Code 3788)
Cable adapter D-Sub 9-pin ↔
- 3 x D-Sub 9-pin (CAN 1, CAN 2, FlexRay), 12 cm (4.7")
 - CDO X.3 (Code 3786-3)
OBD II connecting cable, 3 m (118")
- Cable adapter for differential inputs
 - CDL III.1 (Code 9818-1)
Cable adapter LEMO 8-pin ↔ D-Sub 9-pin, 1 m

Hardware options

(not included)

- Power supply for MMF III.0/ MMF III.0-V1
- Panasonic Toughbook CF-33

Technical Data

General

Number of channels:	54 (12 x Line/ICP, 6 x Temperature, 6 x Differential, 2 x Pulse In, 2 x CAN/OBD-2, 1 x FlexRay, 1 x Auxiliary (GPS), 12 channels each via HL1 and HL2)
Interfaces:	2 x D-Sub 25-pin, 6 x type K, 6 x LEMO 8-pin, 2 x BNC, 2 x D-Sub 9-pin, 1 x D-Sub 15-pin, 1 x Speakon, 1 x LEMO 5 pin, 1 x LEMO 2 pin, 1 x USB, 2 x HEADlink
Resolution:	24 bit
Input voltage:	10.5 V DC to 29 V DC
Max. power consumption:	200 W
Typ. power consumption with empty batteries: with fully charged batteries:	110 W 45 W
USV:	Battery buffer for HCP II /HCP, sensors, all measurement inputs
Cooling:	Temperature-controlled fan
Dimensions MMF III.0 (incl. docking station): MMF III.0-V1:	360 x 345 x 194 mm (WxDxH) (14.1" x 13.6" x 7.6") 357 x 334 x 105 mm (WxDxH) (14" x 13.1" x 4.1")
Weight: MMF III.0 (incl. docking station): MMF III.0-V1:	9.4 kg (20.7 lb) 6,05 kg (13.33 lb)
Operating temperature MMF III.0: MMF III.0-V1:	-10° C to 50° C (14 °F to 122 °F) -10° C to 60° C (14 °F to 140 °F)
Storage temperature:	-20° C to 70° C (-4 °F to 158 °F)

Audio Inputs

Number of channels:	12 (2 x D-Sub 25-pin) (12 channels up to 48 kHz, 6 channels up to 96 kHz)			
Sampling frequencies (F _s):	2 kHz; 3 kHz; 6 kHz; 12 kHz; 24 kHz; 48 kHz; 96 kHz			
Electrical isolation:	Yes			
Coupling:	DC, AC, ICP			
Electric strength:	Max. ±35 V			
Frequency range:	0 Hz to 43.2 kHz at F _s = 96 kHz			
ICP voltage supply:	22 V (typ.)			
ICP current supply:	4 mA (±35 %)			
Input impedance:	30.3 kilohm			
Ranges (AC & DC, inputs are TEDS-compliant):	±10 mV _{PEAK}	±100 mV _{PEAK}	±1 V _{PEAK}	±10 V _{PEAK}
S/N, 20 Hz to 20 kHz, incl. 2.5 Hz filter in AC mode:	84 dB(A)	97 dB(A)	107 dB(A)	106 dB(A)
THD+N, 20 Hz to 20 kHz, incl. 2.5 Hz filter in AC mode:	-79 dB(A)	-95 dB(A)	-100 dB(A)	-95 dB(A)
Crosstalk measurement, termination ≤75 Ω at F _s = 48 kHz:	<100 dB(A)	<120 dB(A)	<130 dB(A)	<130 dB(A)
Frequency response (accuracy final value), 20 Hz to 20 kHz, incl. 2.5 Hz filter in AC mode: Tolerance:	<0.13 dB 1.5 %	<0.052 dB 0.6 %	<0.052 dB 0.6 %	<0.052 dB 0.6 %
DC accuracy (DC mode at 0 Hz): Tolerance:	<0.13 dB 1.5 %	<0.017 dB 0.2 %	<0.009 dB 0.1 %	<0.009 dB 0.1 %
Analog HP filter (not defeatable in AC mode): Analog HP filter 2 nd order (switchable):	2.5 Hz 22 Hz			
TEDS (IEEE 1451.4), read:	TEDS class 1, shared signal wire (version 0.9 and 1.0)			

Pulse Inputs

Number of channels:	2 (BNC)
Electric strength:	50 V
Short pulses (without signal conditioning) voltage threshold:	Ca. 1.1 V
Long pulses (with signal conditioning) Rectangular signal (50 % duty cycle) Input level V_{PP} :	60 mV _{PP} 1000 mV _{PP}
Lower cut-off frequency:	Ca. 25 Hz Ca. 3 Hz
Upper cut-off frequency:	Ca. 25 kHz Ca. 200 kHz
Long pulses (with signal conditioning) Sinus signal Input level V_{PP} :	60 mV _{PP} 1000 mV _{PP}
Lower cut-off frequency:	Ca. 100 Hz Ca. 1 Hz
Upper cut-off frequency:	Ca. 25 kHz Ca. 200 kHz
Pulse sampling frequency:	1.152 MHz

Temperature Inputs

Number of channels:	6 (thermocouple inputs with miniature K type or RTD plugs)
Sampling frequencies (F_s):	1 Hz; 2 Hz; 5 Hz; 10 Hz; 20 Hz; 50 Hz; 100 Hz
Electrical isolation:	Yes (per channel)
Coupling:	DC
Electric strength (In+ ↔ In-):	Max. +3.7 / -0.7 V
Electric strength common mode:	85 V
Resolution:	16 bit
Digital filter:	Yes
Ranges	
Thermo:	-100 °C to 1200 °C
PT100:	-200 °C to 850 °C
PT1000:	-200 °C to 850 °C
Input impedance	
Thermo:	>500 megohm
PT100:	>2.2 megohm
PT1000:	>6.5 megohm
Power supply PT100 / PT1000:	370 μ A, \pm 0.5 %
Accuracy:	\pm 2 °C (-200 °C to 400 °C) \pm 0.5 % of measured value (400 °C to 1200 °C)

HEADlink Inputs (HEAD acoustics standard)

Connecting HEADlab modules:	labT6, labSG6, labDX, labHMS, labV12/labV12-V1/labV12-V2 (no Dual Link)
Synchronization of the channels:	Sample-accurate
Sampling frequencies (F_s):	For each HEADlink interface: 2, 3, 4, 6, 8, 12, 24, 48, 96 kHz (2 channels at 24 kHz; 6 channels at 48 kHz, 3 channels at 96 kHz)

AUX Input

Number of channels:	1 (D-Sub 9-pin)
GPS:	CDG I.1 (GPS receiver)

CAN/OBD-2 / FlexRay Inputs

Number of channels:	3 (2 x CAN bus/OBD-2 / 1 x FlexRay)
When using the FlexRay interface, pulse and AUX input channels may not be available depending on the amount of FlexRay data.	
Interface:	D-Sub 9-pin
CAN:	CAN high speed according to ISO 11898-2
Bit rate CAN Bus:	1 Mbit/s, 500, 250, 125, 100, 50, 20, 10 kbit/s
Identifier (CAN):	11 bits (CAN 2.0A), 29 bits (CAN 2.0B)
Decoding/display of CAN signals CAN signals:	Decoding/display of current vehicle quantities according to vehicle-specific DBC databases (not included)
OBD-2 signals via CAN according to ISO 15765-4:	Request/display of standardized, current vehicle quantities (corresponding DBC databases are included)
FlexRay (A+B):	FlexRay V2.1 Rev. B; a vehicle-specific XML Fibex database is required (not included)
The user must install the line termination in a connector of the user-specific CAN/OBD-2 cable respectively the FlexRay cable or in the cable adapter CMD 0.12, as needed.	

Differential Inputs

Number of channels:	6 (LEMO 8-pin ECA codification)
Sampling frequencies (F _s):	10 Hz; 20 Hz; 50 Hz; 100 Hz; 200 Hz; 500 Hz; 1 kHz; 2 kHz; 6 kHz; 12 kHz; 24 kHz; 48 kHz
Resolution:	24 bit
Electrical isolation:	Yes (85 V per channel)
Digital filter:	Yes
Measurement ranges (voltage):	±1 mV _{PEAK} ; ±3 mV _{PEAK} ; ±10 mV _{PEAK} ; ±30 mV _{PEAK} ; ±100 mV _{PEAK} ; ±300 mV _{PEAK} ; ±1 V _{PEAK} ; ±3 V _{PEAK} ; ±5 V _{PEAK} ; ±10 V _{PEAK}
Measurement range (current):	0 mA to 20 mA
Configuration voltage input Bridge mode: Single ended input	Half, full, quarter (with external resistor)
Configuration current input:	4 mA to 20 mA, 2-wire 0 mA to 20 mA, 3-wire
Input impedance (differential / single ended):	10 megohm
Coupling:	DC
Low-pass 2 nd order (switchable), Butterworth 10 % tolerance:	20 Hz; 30 Hz; 40 Hz; 50 Hz; 60 Hz; 100 Hz; 200 Hz; 300 Hz; 400 Hz; 500 Hz
Electric strength:	Max. ±35 V
S/N, 20 Hz to 20 kHz Ranges:	±1 mV _{PEAK} ±3 mV _{PEAK} ±10 mV _{PEAK} ±30 mV _{PEAK} ±100 mV _{PEAK} 54 dB 64 dB 74 dB 83 dB 87 dB
Ranges:	±300 mV _{PEAK} ±1 V _{PEAK} ±3 V _{PEAK} ±5 V _{PEAK} ±10 V _{PEAK} 95 dB 92 dB 98 dB 97 dB 100 dB

Differential Inputs

THD+N, 20 Hz to 20 kHz Ranges:	1 mV _{PEAK} -51 dB	3 mV _{PEAK} -60 dB	10 mV _{PEAK} -70 dB	30 mV _{PEAK} -70 dB	100 mV _{PEAK} -83 dB
Ranges:	300 mV _{PEAK} -71 dB	1 V _{PEAK} -83.5 dB	3 V _{PEAK} -71.5 dB	5 V _{PEAK} -82 dB	10 V _{PEAK} -82 dB
Crosstalk, 1 kHz Sinus Ranges:	1 mV _{PEAK} 133 dB	3 mV _{PEAK} 133 dB	10 mV _{PEAK} 133 dB	30 mV _{PEAK} 133 dB	100 mV _{PEAK} 127 dB
Ranges:	300 mV _{PEAK} 125 dB	1 V _{PEAK} 111 dB	3 V _{PEAK} 107 dB	5 V _{PEAK} 103 dB	10 V _{PEAK} 100 dB
Frequency response 20 Hz to 10 kHz Ranges:	±1 mV _{PEAK} <0.25 dB	±3 mV _{PEAK} <0.2 dB	±10 mV _{PEAK} <0.04 dB	±30 mV _{PEAK} <0.03 dB	±100 mV _{PEAK} <0.03 dB
Ranges:	±300 mV _{PEAK} <0.03 dB	±1 V _{PEAK} <0.03 dB	±3 V _{PEAK} <0.03 dB	±5 V _{PEAK} <0.03 dB	±10 V _{PEAK} <0.03 dB
DC accuracy Ranges:	±1 mV _{PEAK} 0.17 dB	±3 mV _{PEAK} 0.17 dB	±10 mV _{PEAK} 0.13 dB	±30 mV _{PEAK} 0.13 dB	±100 mV _{PEAK} 0.0173 dB
Ranges:	2 % ±300 mV _{PEAK} 0.009 dB 0.1 %	2 % ±1 V _{PEAK} 0.0043 dB 0.05 %	1.5 % ±3 V _{PEAK} 0.0043 dB 0.05 %	1.5 % ±5 V _{PEAK} 0.0043 dB 0.05 %	0.2 % ±10 V _{PEAK} 0.0043 dB 0.05 %
DC accuracy (4 mA to 20 mA):	Max. 0.1 %				
Common Mode Rejection (50 / 60 Hz), range 1 V Single input:	>52 dB				
Diff. input:	>90 dB				
TEDS (IEEE 1451.4), read:	Class 2				
Sensor supply Symmetric:	±1.3 V to 12 V				
Asymmetric:	2.6 V to 24 V				
Sensor supply Voltage:	V _{bridge} / V _{sensor}			Max. sensor current	
Voltage:	2.6 V to 5 V (±1.3 V to 2.5 V)			43.8 mA	
Voltage:	>5 V to 14 V (±2.5 V to 7 V)			28.6 mA	
Voltage:	>14 V to 24 V (±7 V to 12 V)			20 mA	
Voltage in range ±10 V:	>10 V to 24 V (±5 V to 12 V)			20 mA	
Current 2-wire:	9 V to 24 V			20 mA	
Current 3-wire:	9 V to 18 V			25 mA	

Interfaces for connecting HCP II/HCP

USB:	USB 2.0
VGA (only with MMF III.0):	D-Sub 15-pin
Power supply (Power Out):	12 V to 16 V, 13 W

Variant MMF III.0-V1: Power supply for a computer

In order to ensure a continuous power supply in mobile operation, the computer must be supplied by its own battery or via MMF III.0-V1.

For the power supply of a computer, MMF III.0-V1 provides a 2-pin terminal block connector (max. 10 A output current, incl. 16 A fuse). The output voltage is equal to the input voltage (10.5 V DC to 29 V DC). The connection between the terminal block connector and the car adapter / car charger of the computer must be made by the customer.