■General/performance specifications

Item		Uno	Quattro	Freddo	Freddo Plus
Sampling frequency [MHz]		10			
Frequency filter [kHz]	HPF	No filter, 30, 50, 100, 150		20, 30, 50, 80, 100, 150. 200, 240	
	LPF	1000		80, 100, 180, 200, 360, 400, 600, 1000	
Amplification factor [dB]		(0), 10, 20, 30, 40, 50 (within ±3)		10, 20, 30, 40, 50 (within ±1)	
Applicable AE sensor		FAEN-S60(W)I / FAEN-S150(W)I / FAEN-S300(W)I			
Number of connected sensors		1	4 (switching measurement)	1	
Edge processing time [ms]		10, 20, 50, 100, 1000, 2000	10, 20, 50, 100	1, 10. 20, 50, 100, 1000, 2000, 5000, 10000, 20000	
Logging time [s]		Continuous		Continuous / 1 to 20 (0.1s incr.)	
PIO (sink and source logics)		-	Inputs: 2 p / Outputs: 6 p	-	Inputs: 8 p / Outputs: 8 p
Touch Sensor Output		-		1 point	
Communication method		Ethernet: 100base-TX / PC: Dedicated cable USB-A		Ethernet: 100base-TX / PC: USB-C	
Connectable PLC		MITSUBISHI ELECTRIC MELSEC iQ-R / iQ-F / Q series		MITSUBISHI ELECTRIC MELSEC iQ-R series	
Internal storage device		eMMC for storing various setting data (IP address, gain, etc.)			
External storage device		-			micro SDHC (UHS-I U3 or V30 higher)
Ambient operating temperature		-10 to +55 ℃			
Ambient operating humidity		20 to 80 %RH (with no dew condensation)			
Storage ambient temperature		-20 to +75 ℃ (with no dew condensation)			
Conforming standard		-		CE acquisition planned	
Power voltage		12 to 24 V DC (10W or less)			
Measurement / Calculation items		Amplitude-MAX [mV] : Edge Processing Data		Amplitude-MAX [mV]: Edge Processing Data/Calculated value	
		Energy [dBs] : Edge Processing Data		Energy [dBs]: Edge Processing Data/Calculated value	
		RMS [mV] : Edge Processing Data		RMS [mV]: Edge Processing Data/Calculated value	
		COUNT [pieces] : Edge Processing Data		COUNT [pieces]: Edge Processing Data	
		Amplitude-dB [dB] : Edge Processing Data		–	
Mass [g]		Approx. 600	Approx. 1100	Approx. 550	Approx. 650
Outside dimensions [mm] (D×W×H*) * Excluding protrusion		160×72×120	160×125×120	110×70×91	110×93×91
Environment		Conforming to RoHS Directive			

■Freddo Plus input/output signals

Input		Output	
2	AE measurement	12	AE measurement answerback
3	Logging	13	Logging answerback
4	Type 1	14	Type answerback 1
5	Type 2	15	Type answerback 2
6	Type 3	16	Type answerback 3
7	Spare	17	Threshold alarm 1
8	Spare	18	Threshold alarm 2
9	Threshold alarm reset	19	Device normally working

■AE measurement compatibility table

Early Observer MEL-E	MELSEC			Controller only	Windows software
	iQ-F	Q	iQ-R		
Uno	√	√	√	-	√
Quattro	√	√	√	-	√
Freddo	-	-	√	-	√
Freddo Plus	-	-	√	√	√

* This product is a data logging system adopting the AE sensor as a key technology, which does not guarantee machine failure sign diagnosis result or quality control.

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* As of November 2025 The specifications may be changed notice.

Disruptive innovation

Early Observer MEL-E

Machine Failure Sign & QA

MITSUBISHI ELECTRIC MELSEC compatible

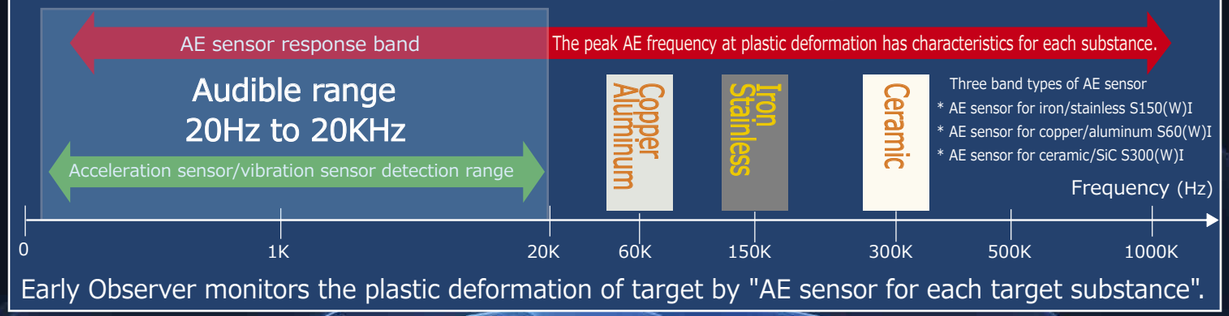
Contact

JCC Co., Ltd.

Measurement shifts from "Vibration" to "Energy"

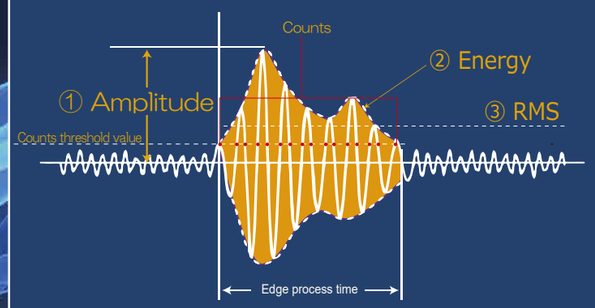
Monitoring the high-frequency wave exceeding the human audible area to visualize the sign before "oscillation / breaking".
Original AE sensor and parameterization technology construct the system that does not require FFT analysis.
Non-conventional sensing performance and unprecedented usability are realized.

<Each sensor's response band and AE sensor for each target substance>



Early Observer monitors the plastic deformation of target by "AE sensor for each target substance".

<Parametarization of AE sensor signal>



① Amplitude (= maximum amplitude)
The maximum amplitude value of AE waveform (voltage from 0V to maximum displacement) is converted to dB = having a correlation to crack propagation / amount of friction.

② Energy
Integral value of AE waveform within duration = having a correlation to amount of friction / crack area.

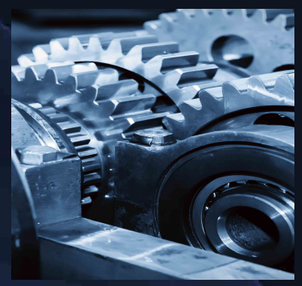
③ RMS (effective value)
Effective value of AE signal obtained for every Edge process time unit = having a correlation to friction coefficient

* Edge process time (transmission interval to MELSEC) 10/20/50/100ms are settable.
* The response speed of the sensor is 0.1μs and the amplitude parameter reflects 0.1μs signal too.

Case examples of signs of equipment by Early Observer

★Bearing

Measures the energy generated by internal metal contact.
The condition of scratches and lubrication is measured and visualized.
There are signs before the vibrations start.



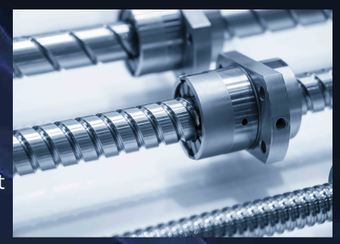
★Robot gear, reducer

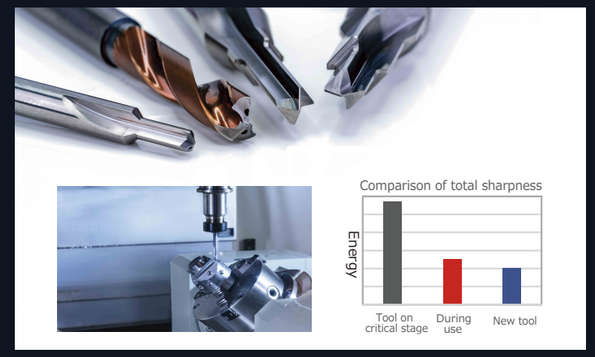
It is possible to monitor the internal lubrication condition and detect cracks that have occurred in internal structures such as gears.

Please note that the new gears don't mesh well, so the data will be larger.

★Ball screw

It measures the energy generated at the contact surface between the screw and nut.Monitors lubrication and damage conditions.
As wear progresses, the contact area decreases and the energy generated also decreases.





★Tool damage / Wear monitoring

When machining a workpiece, metal deformation occurs.
By measuring the energy generated during processing, the following information can be obtained.

- Tool damage
- Wear condition of blade (sharpness)

(Minimum tool diameter)
- Breakage detection Φ0.05
- Coating peeling Φ0.2

★Touch sensor feature (Feature of Freddo series)

An external signal is output 2/1000 seconds after the tool comes into contact with the workpiece.
A precisely machined workpiece can achieve the following benefits.

- No need to measure tool length / Reduced cycle time
- No need to install a tool setter.
- Improved processing accuracy.

★Data calculation feature (Feature of Freddo series)

The total energy measured during each measurement is calculated and output as data at the end of processing.
This can be used as tool sharpness data.

Mitsubishi Electric MELSEC compatible MEL-E series

e-F@ctory Alliance

Type Uno

Type Quattro

Type Uno/Quattro

- High speed monitoring feature 0.1μs data measurement
  10ms Edge processing time.
- HPF selection feature External Selection(LPF 1MHz semi-fixed)
- Fail-safe feature Breaking/short/abnormal voltage
- Sensor signal check feature

Type Quattro exclusive features

- 4-axis sensor connections 4-axis switching measurement

Freddo

Freddo Plus

Freddo/Freed Plus

- High speed monitoring feature 0.1μs data measurement
  1ms Edge processing time.
- LPF selection feature HPF and LPF external selection feature
- Measurement Data calculation feature Equipment failure signs/Tool condition
- Touch sensor feature High-speed detection of contact between tool and workpiece

Freddo Plus exclusive feature

- Controller stand-alone measurement feature By external PIO
- Threshold alarm feature Stores 2 threshold values for 8 varieties
- microSDHC card slot Recording measurement data
- Measurement time timer feature (Set from 1 to 20 s in 0.1 s incr.)

*The Freddo series can only communicate with MELSEC iQ-R and PC software.

AE sensor

(Common specifications)
- Resonance frequency: 60/150/300kHz ±20%
- Operating temperature: -20 to 80°C

(Standard sensor)

- Φ20 x 26.5mm (excluding protruded part)
- BNC connector
- Protective structure IP52F

(Waterproof sensor)

- Φ22 x 30mm (excluding protruded part)
- Equipped with environmentally resistant robot cable (5m)
- Waterproof and protective structure IP67

Extension cable for AE sensor

	Standard cable	Environmentally resistant robot cable
External diameter	Φ5	Φ4
Ambient operating temperature	-20 to 60℃	-253 to 200℃
Flex resistance	–	✓
Acid resistance	–	✓
Alkali resistance	–	✓
Sheath	Vinyl chloride	Fluorinated ethylene propylene

* The maximum cable length of the system is 20m.
* To extend the cable, use the waterproof relay connector set (OP).

AE measurement compatibility table

Early Observer MEL-E	MELSEC			Controller only	Windows software
	iQ-F	Q	iQ-R		
Uno	✓	✓	✓	-	✓
Quattro	✓	✓	✓	-	✓
Freddo	-	-	✓	-	✓
Freddo Plus	-	-	✓	✓	✓

Early Observer Package Products

Potable set	A set of products required for AE measurement using a PC
Carry	Lightweight portable MELSEC built-in unit.
BLOCK	MELSEC built-in control panel.
Friction Sonar	NC monitoring system incorporating MELSEC iQ-R