

DATA SHEET

CALMS - Compressed Air Energy Management System

CALMS CAL-PM-x is Remote Energy Management System, Datalogger and Compressed Air Control System. System is doing real time access to data from any web browser for end user and their service partner.

Benefits

- Save on energy costs,
- Improve your energy efficiency,
- Save your time and improve the organization,
- Distribute costs in relation to actual consumption,
- Improve the reliability of your equipment,
- Improve forecast of energy consumption,
- Improve your environmental image,
- Improve the investment process (energy equipment).
- ISO 50001:2011, Energy management systems compliant



FEATURES:

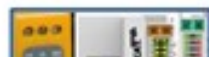
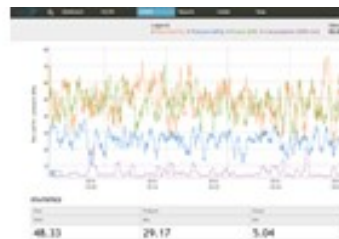
- Three in one - measuring, remote monitoring/ alarming/ reporting system and optional PLC control system for compressed air applications
- Can connect to almost any compressor and sensor
- WEB based application management system
- Measuring datalogger for compressed air system detail analysis
- Energy management – Specific Power, M/T, CuSUM analysis
- Detail Analysis of Compressed Air System with Report, done after customer confirmation based on Auto generated Warning of poor efficiency with potential savings calculation compared to best in class efficiency from CALMS Knowledge Database
- SIMULATIONS
- Expandable
- Secure internet connection between CAL-PM and platform
- Multiple data export options (CSV, XML), and easy online printing
- Built-in web browser
- Automated Monthly Reports send on Emails
- Alarms&Warnings Email or SMS notification with stored Analysis data
- Multiple access for end users and experienced CA service providers
- Easy to use interface
- Remote software upgrade capability
- Dual system PLC and PC Windows CE operating system
- EtherCAT (ethernet or optic)
- GPRS cellular modem 3G / 4G
- No need for local operator panels – access from anywhere with tablet or smartphone
- Industrial design
- Dimensions: 300mm x 380mm x 210mm
- Wall mounting bracket

Compressed Air Key Measurements:

- Analog
 - Pressure
 - Flow
 - Power for each Compressor
- Digital
 - Compressor On/Off
 - Compressor Load/Unload
 - Compressor Alarm
 - Dryer status
 - Other equipment status
- Optional
 - Dew Point
 - Ultrasound vibration amplitude detector
 - Temperature
 - Branch Flow
 - MODBUS or any other bus connection

All functionalities in one single device-data logger

- Electricity consumption measurement (kWh)
- Direct data interchange / communication (GPRS)
- Concentrator (analog inputs / outputs)
 - Connection of additional meters and sensors
 - Tracking of process values
 - Remote control of the devices
- Detail Analysis through service partner
- Equipment performance analysis and alarming



CALMS CAL-PM-X OPTIONS

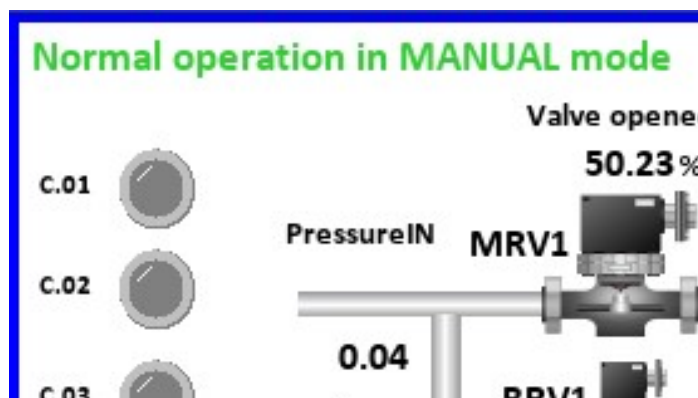
CALMS-EMCS: Energy Management Control System – compressor sequencer option

- Sequencing up to 16 compressors
- Multiple pressure profiles
- Multiple control modes (Energy efficiency, schedules)

COMPRESSOR PRIORITIES:			
	Start. prior.	Stop. prior.	
C.01	2	3	Next
C.02	3	2	Next
C.03	4	1	Next

CALMS-CFC: CALMS Flow Controller

- Isolates supply side from demand side
- Maintain system pressure as low as possible
- Possibility to adjust pressure settings with schedules
- Fail safe operation with Normally open Bypass valve



CALMS-SOV: Shut Off Valves

- Connect up to three shut of valves
- Adjustable open and close times through schedules



SPECIFICATION:

CALMS-CAL-PM is a hardware that connects compressed air system (CAS) to Internet based application for energy management.

For CAS up to x compressors you need **base station CAL-X-BASE** and for each compressor you need **Compressor Interface Module kit CS-C-ON/OFF** or **CSC-C-VSD** (depends on the type of the compressor; on/off or VSD).

NOTE:

CALMS CS system is expandable from CS-2 to CS-4 and even to CS-8 or CS-16. If you increase number of compressors from 2 to 3 you can only install new compressor module CS-C-xx and change CALMS from CS-2 to CS-4.

You can also expand system with many Options like additional new sensors, more Analog Inputs, Digital Inputs...

CALMS CS is also prepared as PLC Control System for compressors (as simple add on function).

BASE STATION:

Description	CAL-2 BASE	CAL-4 BASE	CAL-8 BASE	CAL-16 BASE
s-PLC Controller	Processor 32 bit, 400Mhz Flash Memory microSD 1GB Internal Memory 64 MB RAM	Processor 32 bit, 400Mhz Flash Memory microSD 1GB Internal Memory 64 MB RAM	Processor ARM Cortex, 1Ghz Flash Memory microSD 1GB Internal Memory 1 GB DDR3 RAM	Processor ARM Cortex, 1Ghz Flash Memory microSD 1GB Internal Memory 1 GB DDR3 RAM
Protocol	Real-time Ethernet, ADS TCP, Modbus TCP, TCP/IP, UDP/IP, EAP	Real-time Ethernet, ADS TCP, Modbus TCP, TCP/IP, UDP/IP, EAP	Real-time Ethernet, ADS TCP, Modbus TCP, TCP/IP, UDP/IP, EAP	Real-time Ethernet, ADS TCP, Modbus TCP, TCP/IP, UDP/IP, EAP
Interfaces	3x Ethernet 10/100Mbit/s (2x network adapter)	3x Ethernet 10/100Mbit/s (2x network adapter)	2x Ethernet 10/100Mbit/s 4x USB 2.0, 1x optional interface	2x Ethernet 10/100Mbit/s 4x USB 2.0, 1x optional interface
UPS	1-second UPS (for 1 MB persistent data)	1-second UPS (for 1 MB persistent data)	1-second UPS (for 1 MB persistent data)	1-second UPS (for 1 MB persistent data)
Possible number of connected compressors	2	4	8	16
WEB management	yes	yes	yes	yes
EMCS, CFC, SOV	yes (optional)	yes (optional)	yes (optional)	yes (optional)
Visualization	4,3" Touch HMI	4,3" Touch HMI	7" Touch HMI	7" Touch HMI
Logging Interval	5 sec	5 sec	5 sec	5 sec
CS to Internet Upload interval	5 min	5 min	5 min	5 min
Data Storage	SD 512 MB	SD 512 MB	SD 1 GB	SD 1 GB
Cloud connection	3G/4G	3G/4G	3G/4G	3G/4G
Operating Range	0 – 50 C (32 F – 131 F)	0 – 50 C (32 F – 131 F)	0 – 50 C (32 F – 131 F)	0 – 50 C (32 F – 131 F)
Power supply	100- 240Vac 50-60Hz	100- 240Vac 50-60Hz	100- 240Vac 50-60Hz	100- 240Vac 50-60Hz
Size	H 210 x W 300 x L 380 mm H 8,26 x W 11.81 x L 14.96 Inches	H 210 x W 300 x L 380 mm H 8,26 x W 11.81 x L 14.96 Inches	H 210 x W 300 x L 380 mm H 8,26 x W 11.81 x L 14.96 Inches	H 210 x W 300 x L 380 mm H 8,26 x W 11.81 x L 14.96 Inches
Materials	Enclosure: Steel cabinet, Cable Entry ICOTEK	Enclosure: Steel cabinet, Cable Entry ICOTEK	Enclosure: Steel cabinet, Cable Entry ICOTEK	Enclosure: Steel cabinet, Cable Entry ICOTEK
Mounting	Mast or wall mounting	Mast or wall mounting	Mast or wall mounting	Mast or wall mounting
EMC	EN 61000-6-2/EN 61000-6-4	EN 61000-6-2/EN 61000-6-4	EN 61000-6-2/EN 61000-6-4	EN 61000-6-2/EN 61000-6-4

Class	IP54	IP54	IP54	IP54
Approvals	CE	CE	CE	CE
Digital inputs*	12	24	40	72
Analog inputs*	4	8	8	8
Digital outputs*	12	20	36	68
Analog outputs**	N/A	N/A	N/A	N/A
Power inputs*	2	4	8	16

* with maximum CAL-C modules installed

** depends on number of VSD compressors (AO only in CS-Cxx-VSD modules)

Description	Input Range	Resolution
Analog Inputs	4-20 mA	12 bit
Analog Outputs (only in CS-C-VSD)	4-20 mA	12 bit
Digital Inputs	1-wire connection (24 VDC)	
Digital Outputs	Relay Rated for 24 VDC and max. 0,5 A	
Power Inputs (installed in CS-C-xx)	Current, voltage, effective power, apparent power, frequency Reactive power, energy, efficiency factor ($\cos\varphi$) max. 500 V AC 3~ (ULx-N: max. 288 V AC)	

COMPRESSOR MODULES

Each compressor connected to BASE STATION needs interface module

Description	CAL-C-ON/OFF	CAL-C-VSD
Coupler	Module Coupler for E-bus terminals with integrated digital I/Os: – 4 digital inputs 24 V DC, filter 3.0 ms, type 3 – 4 digital outputs 24 V DC, 0.5 A, 1-wire system – E-bus power supply, current max. 1 A	Module Coupler for E-bus terminals with integrated digital I/Os: – 4 digital inputs 24 V DC, filter 3.0 ms, type 3 – 4 digital outputs 24 V DC, 0.5 A, 1-wire system – E-bus power supply, current max. 1 A
Protocol	EtherCAT (to base station)	EtherCAT (to base station)
Bus Interface	2 x RJ 45 switched EtherCAT module	2 x RJ 45 switched EtherCAT module
Mounted in	ON/OFF compressors	VSD compressors
Power Supply	Power Supply 24Vdc, 1A, 24W	Power Supply 24Vdc, 1A, 24W
Analog outputs	None	2x
Size	H 10 x W 8x L 15 cm H 3.9 x W 3.1 x L 5.8 Inches	H 10 x W 8x L 15 cm H 3.9 x W 3.1 x L 5.8 Inches
Weight	0.3 kg (0.6 lbs)	0.3 kg (0.6 lbs)
Materials	Enclosure: PBT Polycarbonate, ABS plastic	Enclosure: PBT Polycarbonate, ABS plastic
Mounting	DIN Rail Mounting in compressor cabinet	DIN Rail Mounting in compressor cabinet
EMC	EN 61000-6-2/EN 61000-6-4	EN 61000-6-2/EN 61000-6-4
Class	IP23	IP23
Approvals	CE	CE
Power analyzer	3-phase power measurement terminal, max. 500V AC 3~, max. 5 A, via measuring current transformers x A/5A Accuracy: ANSI 12.20 1% accuracy, IEC 62053-22 Class 1S Compatible with CTs from 5 to 32000A UL listed, CE, ANSI C12.20 3 pcs Current Transformer coils 0-500 A / 5A as standard (as Option available also Split core CT and different sizes)	3-phase power measurement terminal, max. 500V AC 3~, max. 5 A, via measuring current transformers x A/5A Accuracy: ANSI 12.20 1% accuracy, IEC 62053-22 Class 1S Compatible with CTs from 5 to 32000A UL listed, CE, ANSI C12.20 3 pcs Current Transformer coils 0-500 A / 5A as standard (as Option available also Split core CT and different sizes)

	Accuracy 1 % (U/I), 1.5 % calculated value (P) (at 0°C ... +55°C, of the full scale value)	Accuracy 1 % (U/I), 1.5 % calculated value (P) (at 0°C ... +55°C, of the full scale value)
Power measurement For each compressor	Build in energy efficiency and power management with the Power & Energy Meter. This cost-effective analyzer is simple to deploy and is standard build in CS-C-xx modules. Module with Power meter comes on standard DIN Rail and should be installed in each compressor to monitor power: Measures AC Current, AC Voltage, Amp Hour (Ah), Amps (A), Kilowatt Hours (kWh), Kilowatts (kW), Power Factor (PF), Volt-Amp Reactive (VAR), Volt-Amp Reactive Hour (VARh), Volt-Amps (VA), Volts (V), Watt Hours (Wh), Watts (W) Range: 90-600VAC – Wye or Delta configurations	

CALMS Internet Application Description:

Monitoring Process System

- Table data View
- Chart data View Trend (1sec - 1min, 5 second avg. sample rate)
- Chart data View History (1min – unlimited - 10 minutes avg. sample rate)
- Tag selection
- Selection of measuring period
- Table data export of selected measurement range (XLS)
- Chart PDF printing
- Secure connection
- System Setup (based on CALMS CAL PM-2, 4, 8)

Analytical system:

- Specific power Chart
- Statistical values
- Histograms
- XY Charts
- Cumulative Charts (kWh, m3, EUR)
- CuSUM Charts and analysis based on wanted specific power
- Alarm / Warning Analysis data (5 second sample rate)

Alarms and Warnings:

- Alarm settings
- Warnings Settings
- Table View of all Alarms and Warnings
- Alarm & Warning Status, confirmation and acknowledge
- Alarm & Warning Notification: Emails setting, SMS – option
- Auto generated Alarms (poor system specific power as CALMS knowledge database, compressor poor operation due to power analyzer (unload, full load, specific power), compressor ultrasound warning, alarm and shutdown

Reports:

- Automatic Monthly Compressed Air Report for Company
- Automatic Monthly Compressed Air Report for Locations
- Custom Reports
- Reports Table View
- Reports Email setting for auto delivery

Simulations:

- Performing simulations on real systems with real data
- Comparing simulated data with measured data
- CFC simulation

Services:

- Overview on compressors service intervals and compressors history service data

CALMS – Compressed Air Energy Management System – Process Diagram

CAEMS Process Diagram

