



**LOAD
MONITORING
SYSTEMS
FOR MOTOR
DRIVES**

wtele
Technik Braucht Kontrolle

LOAD- MONITORS

TELE load monitoring systems offer significant advantages, particularly in situations in which monitoring tasks are usually carried out by sensors:

- No problems due to contamination and any decalibration of the sensors
- No maintenance and cleaning costs
- Easy to use, even in charged air or volatile substances
- Savings in terms of cabling
- No use of explosion-proof barriers necessary
- Reduction in error sources
- Simple retrofitting

The motor as a sensor

Useful data can be collected regarding the condition of motor drives, machinery and systems from the load conditions of electrical motors. It is sometimes also possible to obtain helpful information on production and conveyance goods. Depending on the application, a survey of the performance factors or the effective power can reveal attributes such as throughput, loading, viscosity, signs of wear, contamination and any damage.

TELE load monitoring systems take over the precise and reliable monitoring of the load status and, in the event of an undercutting or exceedance of limit values, either provide fault indications or execute remedial measures by means of controlling switching processes.

This increases the availability as well as the safety of systems. Service work is reduced and production downtimes can be prevented.

Depending on the application it is possible to choose from multiple current or voltage ranges. Tripping and response times as well as switching thresholds can be set separately – thermistor monitoring, current dropout monitoring, error memory, relay outputs and analogue outputs are also optionally available.

This facilitates the reporting of faults and abnormal statuses, the logging of measurement data and the initiation of further controlling functions.

TELE is the supplier with the largest range of load monitoring systems and has just the right product available for every requirement ... precisely tailored.

Up to 16 amperes measurement can take place directly; transducers are therefore only required with higher currents. All products are suitable for use with single and three-phase loads as well as voltages partially up to 690 volts. Additionally, it is possible to install and conduct measurements after frequency converters.



Even when only monitoring the viscosity of cake mixture: Everywhere where electrical motors are in operation, the load monitoring systems from TELE are at work.



Trash Compactor

Under- and overload monitoring of motor drives of screw compactor or hydraulic pumps and control of refilling

load monitor detects

- blockages
- leakage of hydraulic lines
- shaft bearing damage
- breakage of a drive element such as coupling

load monitor controls

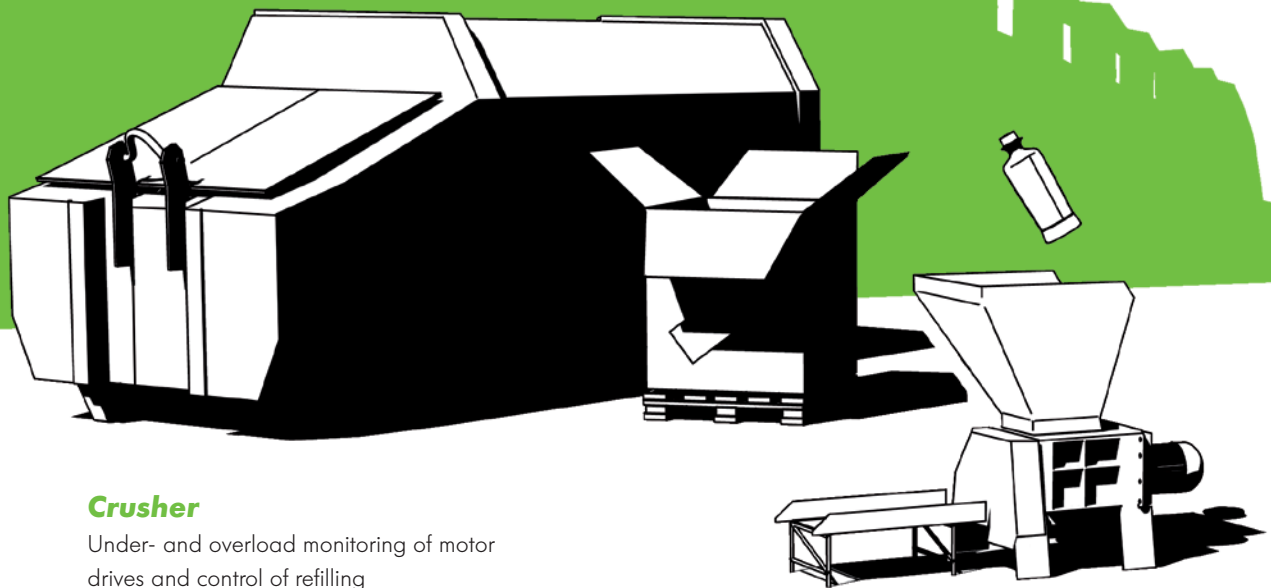
- reversing and limit stop
- automatic in-feed of material if loaded by a conveyor system

load monitor protects and spares

- mechanical components
- container against overfilling and deformation

load monitor saves

- hydraulic valves for control in the case of hydraulic construction



Crusher

Under- and overload monitoring of motor drives and control of refilling

load monitor detects

- blockages
- breakage of drive element
- bearing damage
- idling

load monitor controls

- automatic in-feed of material, if conveyer system loaded

load monitor spares

- grinders

load monitor prevents

- load peaks when starting, because switch-off only during idling

load monitor optimises

- flow rate, since in-feed quantity is controlled load dependent to run the crusher at optimal operating point

Mixers

Under- and overload monitoring of motor drives

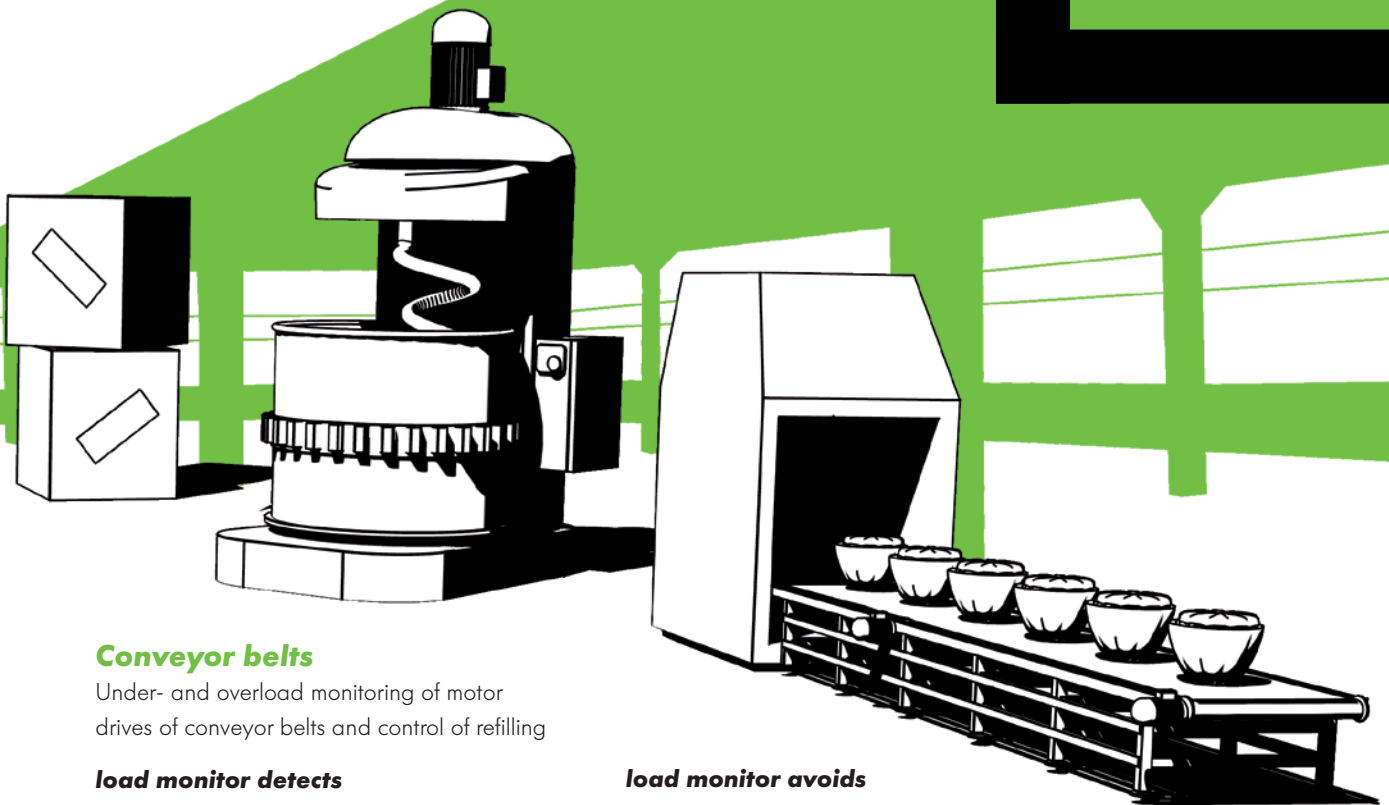
load monitor detects

- viscosity of medium to be mixed
- damage and falling off of mixer blade
- breakage of drive elements such as shaft or coupling
- shaft bearing damage
- blockage

load monitor controls

- dosing to achieve desired viscosity

APPLICA- TIONS



Conveyor belts

Under- and overload monitoring of motor drives of conveyor belts and control of refilling

load monitor detects

- loading
- material accumulation
- slipping of belt rollers
- breakage or cracking of drive element
- jamming of conveyor material

load monitor controls

- in feed, if loaded by an upstream conveyor system
- dosing depending on maximum motor performance, taking slipping moment into account

load monitor avoids

- damage to conveyor system by jammed material
- overloading of conveyor system

Ventilation systems

Under- and overload monitoring of motor drives of ventilators

load monitor detects

- breakage or cracking of drive elements such as V-belts
- blocked filters
- closed flaps
- air flow rate
- shaft bearing damage

load monitor reduces

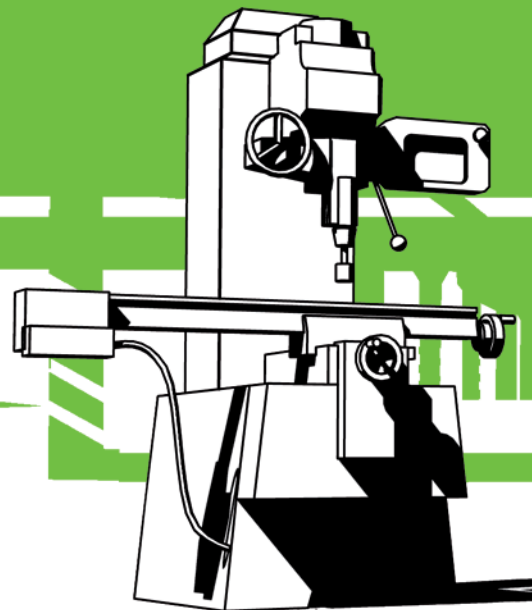
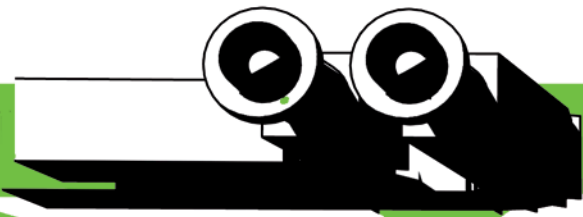
- potential error sources

load monitor requires no

- external sensors such as pressure load cells
- additional auxiliary and evaluation relays
- explosion-proof Zener barriers to reduce ignitability of electrical circuits

load monitor saves

- time and money for planning and execution, since no sensors, auxiliary or evaluation relays and wiring effort are required
- sensor maintenance and cleaning costs



Machine tools

(drilling, cutting, grinding, planing, etc)

Under- and overload monitoring of motor drives of machining tools, coolant pumps, swarf conveyors and control option of feed unit

load monitor avoids

- damage to work pieces and machines

load monitor optimises

- feed and in-feed size depending on material properties of work pieces

load monitor checks

- automatic table reversal to avoid air-grinding in the grinding process

load monitor detects

- wear and breakage of machining tools
- blockage of machining tools, for example jamming of saw blades
- material accumulations on swarf conveyors and possible jamming
- problems in cooling- and lubrication circuits and possible blocked strainer

Bridge and portal cranes

Overload monitoring of hoist motors

load monitor detects

- load
- overload
- breakage of drive element

load monitor reduces

- maintenance efforts

load monitor increases

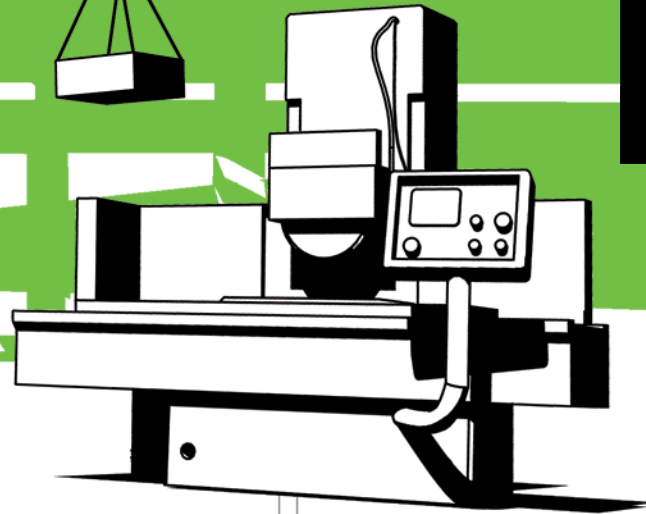
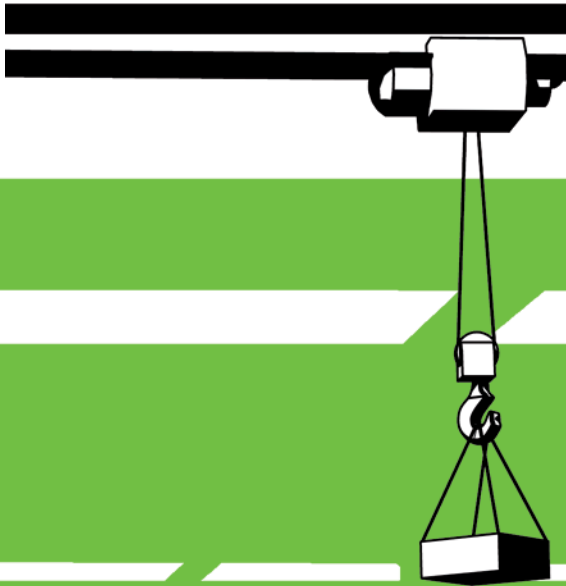
- reliability

load monitor offers

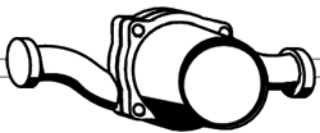
- a simpler solution than using measuring systems with strain gauges as in cable force transducers and load cells
- data logging possibility

load monitor saves

- costs for original fittings and equipment



APPLICA- TIONS



Centrifugal and piston pumps

Under- and overload monitoring of pump motors and control of flow rate

load monitor detects

- dry running of pump
- overload as for example from pipe burst at the outlet
- material damages of pump seals and bearings (especially in magnetic coupled pumps).
- closed valves or blocked filters
- coupling break

load monitor controls

- flow rate

load monitor avoids

- damage to the entire pump

THEORY

Current monitoring relays

Pure current measurements in the supply to motors can only be used in an extremely restricted capacity to monitor loads. This is due to three essential factors:

- In alternating current circuits, the measured current is apparent current. This total current comprises the sum of reactive and active current components. However, when generating mechanical power it is the active current that is exclusively decisive. The reactive current merely causes losses and does not contribute to the shaft power delivered.
- In an underload range the current does not reduce in a linear manner with the load but instead remains relatively high due to the necessary magnetisation current. Therefore, no relevant correlation exists between current and load.
- The current is dependent on the supply voltage. An undervoltage condition with a constant load can result in an increased current draw. This therefore eliminates monitoring the pure active current too.

Thus, monitoring pure current is only applicable in extreme operating conditions, such as a drive blockage, because the current rises dramatically in such cases.

Load monitoring systems with power factor measurement ($\cos \varphi$)

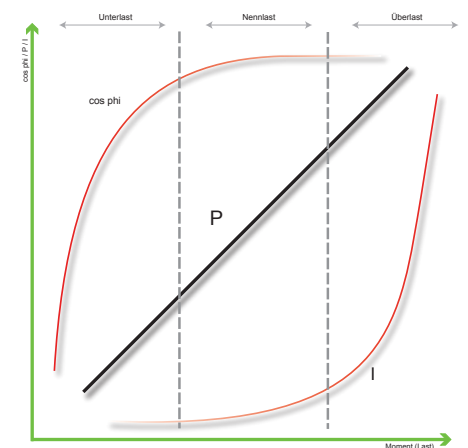
The power factor $\cos \varphi$ is the cosine of the phase shift angle between the current drawn and the voltage applied. In electrical motors this is dependent on the loading and theoretically equals 1 in an ideal case. However, due to induction it effectively lies within a range of 0.85 to 0.95 with a nominal load.

In an underload range, the $\cos \varphi$ monitor is extremely significant because the proportion of losses at a lower load increases dramatically and results in a $\cos \varphi$ of up to <0.5 in an idle state.

This is not applicable around the zero point and in an overload range because load changes only result in minimal changes to the phase shift angle φ .

Load monitoring systems with effective power measurements

The effective power measurement facilitates obtaining the most precise feedback regarding the state of an electrical motor because the effective power is proportional to the shaft power. A direct correlation exists between the effective power supplied and the motor loading (torque with constant rotational speed) across the entire working range.



APPLICA- TIONS

Machine tools		
Wear of machining tools		■
Breakage of machining tools	■	■
Blockage (jammed material)		■
Material accumulation		■
Problems in cooling- and lubrication circuits		■
Centrifugal and piston pumps		
Dry running	■	■
Overload		■
Material damages (pump seals and bearings)		■
Closed valves or blocked filters	■	■
Coupling break	■	■
Blockage		■
Flow rate ¹⁾	■	■
Bridge and portal cranes		
Load		■
Overload		■
Breakage of drive element	■	■
Blockage		■
Ventilation systems		
Breakage or cracking of drive elements	■	■
Blocked filters or closed flaps ¹⁾	■	■
Air flow rate		■
Shaft bearing damage		■
Blockage		■
Mixers		
Viscosity of medium		■
Damage and falling off of mixer blade	■	■
Breakage of drive elements such as shaft	■	■
Shaft bearing damage		■
Blockage		■
Dosing to achieve desired viscosity ¹⁾	■	■
Conveyor belts		
Loading		■
Material accumulation		■
Slipping of belt rollers	■	■
Breakage or cracking of drive element	■	■
Jamming of conveyor material		■
Feed charge controlling ¹⁾	■	■
Crusher		
Blockage		■
Breakage of drive element	■	■
Bearing damage		■
Idling	■	■
Feed charge controlling ¹⁾	■	■
Trash Compactor		
Leakage of hydraulic lines	■	■
Blockage		■
Shaft bearing damage		■
Breakage of drive element	■	■
Reversing and limit stop		■
Feed charge controlling ¹⁾	■	■

¹⁾ Load monitor with relay output can only be used as discrete controller, load monitor with analog output can be used as continuous controller

PRODUCTS

COS φ - MONITORS

LOAD-MONITORS

Type designation	G2CU400V 10AL10	G2CM400V 10AL20	G2CM400V 2AL20	G2BM400V 12AL10	G2BM400V 12AFL10	G2BM480V 12AFL10	G4BM480V 12ATL20
Art. No.	2390600	2390602	2390606	2390700	2390702	2390707	2394702
Module width	22,5mm	22,5mm	22,5mm	22,5mm	22,5mm	22,5mm	45mm
Rated current	10A	10A	2A	12A	12A	12A	12A
Measuring voltage	up to 230/400V	up to 230/400V	up to 230/400V	up to 230/400V	up to 230/400V	up to 277/480V	up to 277/480V
Supply voltage	12-440VAC with TR2 ¹⁾	12-440VAC with TR2 ¹⁾	12-440VAC with TR2 ¹⁾	12-440VAC with TR2 ¹⁾	12-440VAC with TR2 ¹⁾	12-440VAC with TR2 ¹⁾	12-500VAC with TR3 ²⁾
Underload	■	■	■	■	■	■	■
Overload		■ ³⁾	■ ³⁾	■	■	■	■
Under- and Overload (Window)		■ ³⁾	■ ³⁾				■
I=0 recognition of disconnected consumers ⁴⁾	■	■	■	■	■	■	■
Temperature monitoring of motor windings							■
Adjustable threshold	■	■	■	■	■	■	■
Adjustable hysteresis ⁵⁾		■	■				
Fault latch	■	■	■	■	■	■	■
Start-up the suppression ⁶⁾	■	■	■	■	■	■	■
Tripping delay	■	■	■	■	■	■	■
Reduced tripping time					■	■	
Digital handling							
Relay output	1W	2W	2W	1W	1W	1W	2W
Analog output							
Fieldbus							

Supply voltage	12VAC	24VAC	42VAC	48VAC	110VAC	127VAC	230VAC
¹⁾ Art. No. TR2	282121	282110	282111	282112	282113	282114	282120
²⁾ Art. No. TR3	285021	285010	285011	285012	285013	285014	285025

³⁾ Due to cos φ characteristics maximum detection is only possible within underload range of the motor.

⁴⁾ Optional detection of disconnected load. A standby condition of the monitoring relay will be triggered.

⁵⁾ For two-point controller, the differential gap (hysteresis) can be set separately. It's the difference between the upper and lower threshold.

⁶⁾ Time function which disables an error message during start up; this enables a start-up without shut off from inrush load.

⁷⁾ Monitoring and controlling functions via PLC.



Technik braucht Kontrolle: A great deal of research and development has been undertaken at TELE and it benefits further from its production base in Austria and a strong team that brings its products to the market. The company grew with time relays and automation components and the focus on monitoring technology still characterizes the company today. As a pioneer and trendsetter, it is able to deliver intelligent solutions for monitoring plants, factories, buildings and machines and keeping them running.

TELE produces up-to-the-minute monitoring and control equipment that satisfies international standards for worldwide deployment at the highest levels of quality – from a passion and out of professionalism.

Established in 1963 as a family owned company, the headquarters and production base in Vienna has generated branches in Germany and Great Britain and a dense network of more than 60 dealers all over the world. Long-standing customers from all areas of industry and fresh ideas for difficult tasks have made us what we are today – a reliable and flexible partner. Here, the striking green design is the external expression of internal values – quality and innovation constitute the basis for our many years of success and our orientation towards the future.

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