TomTom-Tools Ltd.
Zelgli 20
8905 Arni
Switzerland

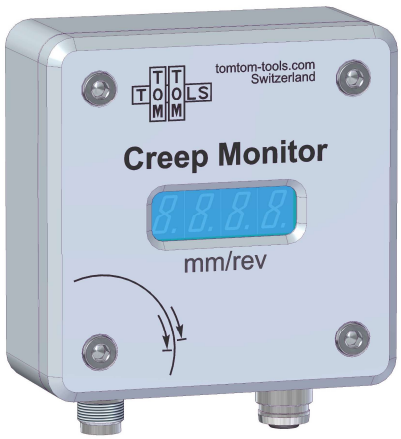
info@tomtom-tools.com
www.tomtom-tools.com

User Manual
Version March 25, 2026

Creep Monitor

Part of Mechanical Kiln Monitoring System (MKM2)

1 INTRODUCTION



The Creep Monitor is part of the new MKM2 System and is used to measure the creep (migration / relative movement) of tires (riding rings) on rotary kilns or dryers. It is designed for permanent installation to provide reliable information about the remaining clearance between kiln shell and tires.
The **great advantage** compared to other systems is that the TomTom-Tools Creep Monitor **provides reliable values already during the heating-up phase** when the kiln is **not** continuously turned yet. During heating the clearance on the tire goes often critically low because the kiln shell heats up and expands much faster than the tire.

The installation and commissioning of the system is very easy and quick. All sensors come with readymade brackets and are connected via pre-assembled connection cables.

Measuring Principle

The controller is comparing the required time for a turn of the kiln shell with the time of the tire. By knowing the shell diameter, the controller calculates the relative movement and displays the value in millimeter per revolution [mm/rev]. Therefore, two sensors are required. One provides the rotation signal from the kiln shell, the other from the tire.

By using the teeth of the girth gear as rotation signal, the full benefit of the Creep Monitor's algorithm can be utilized. With that, the controller does not require continuous rotation to calculate the creep and provides already during the heat up phase reliable results.

The values are shown on the display and are provided via a 4…20mA analog signal.

2 SAFETY

Rotary kilns and dryers, where this tool is typically used, are huge rotating equipment with many pinch points and hot surfaces which can cause serious injuries. Therefore, only specialized and trained personnel shall work close to these machines. For installation, follow strictly the local safety rules given by the respective plant / factory / local authorities and discuss the application with the safety engineer in charge.
The tools provided by TomTom-Tools Ltd. have proven their functionality in various applications; nevertheless TomTom-Tools Ltd. does not take any responsibility for the application on site regarding safety or machine damage. The plant is responsible for the safety, according to the local law, in a way that nobody can be hurt or injured. The application and safety instructions below are guidelines and not exhausted which include the experience from previous installations and might need to be adapted to the local safety requirements.

Caution:

Pinch Points:
Do not put your hands nor any items close or into pinch points.
(e.g. girth gear / pinion, kiln tires / support rollers, …)
Keep safe distance to avoid getting caught by moving parts
(e.g. switch flags on kiln shell and tires)
Install the sensors only when the equipment is stopped

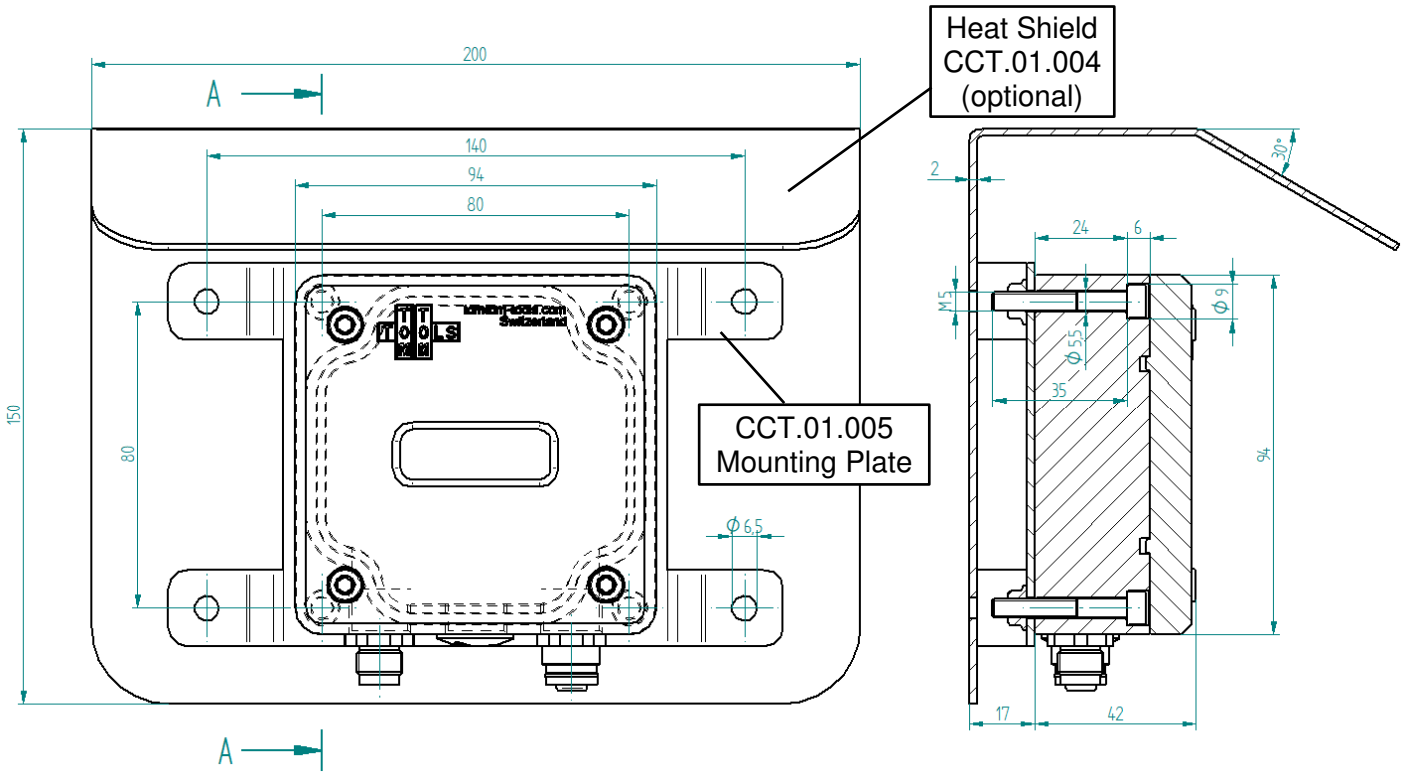
Magnetic Fields:
The magnets attached to some of the components are strong.
Be aware of the strong magnetic fields.
Keep the tool away from people with pace makers or any other sensitive item as credit cards or magnetic data carrier.

Clamping:
Do not put fingers between the magnets and magnetic surface. There is the risk for clamping or pinching, due to the strong magnetic force.

Fire:
Take care about the risk of fire during the installation of the sensors. Special precautionary measures are required at the girth gear, where the lubricant could ignite during cutting and welding on the cover to install the gear sensor.

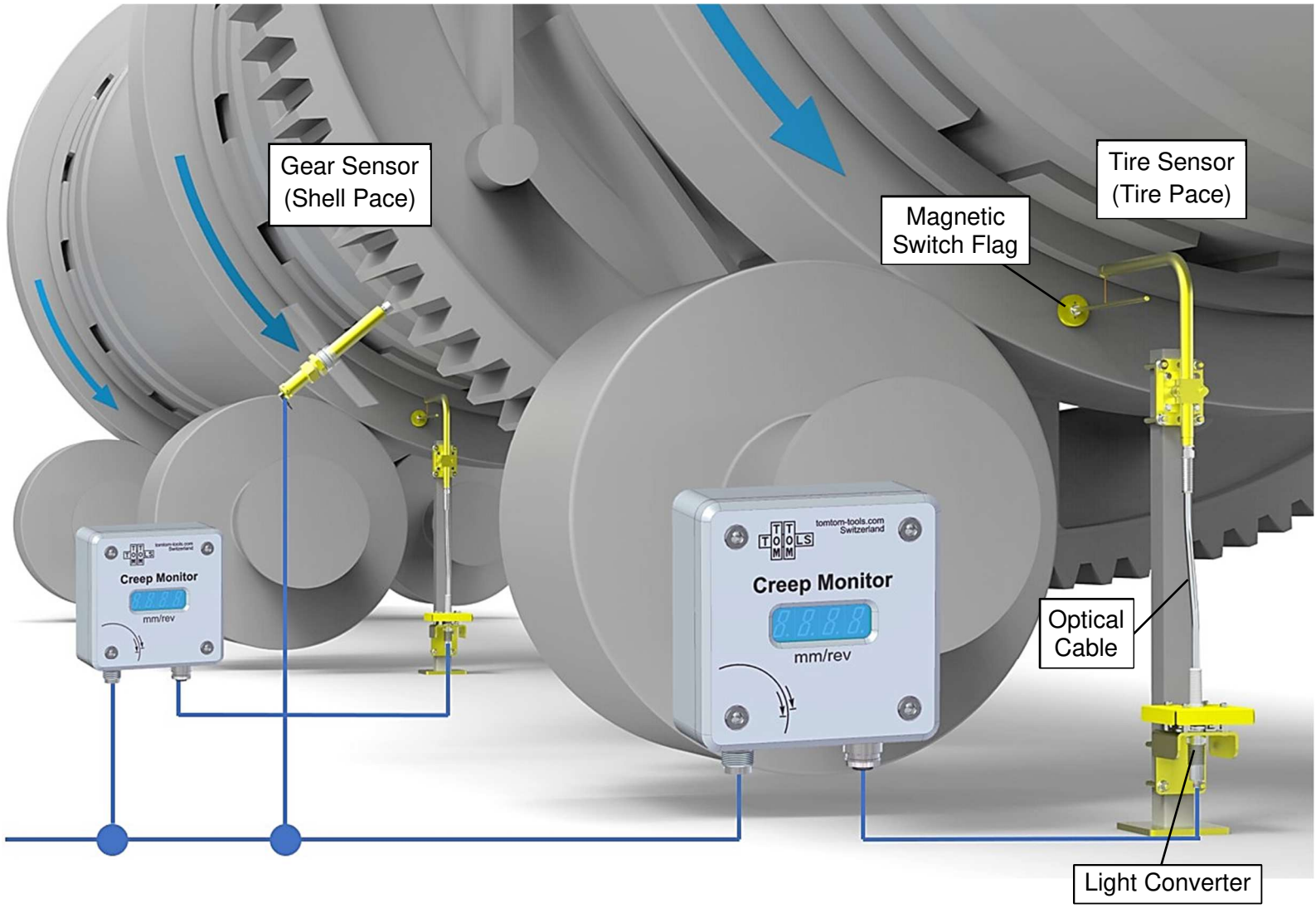
Gloves:
Wear proper gloves to protect your hands from hot and rough surfaces and sharp edges.

TABLE OF CONTENT



3 TYPICAL SETUP

Fig. 3.0.1



Shell Pace Signal:
The kiln or dryer is equipped with one sensor, which provides information about the speed of the shell. Preferable the gear teeth are used to generate the shell pace signal.

Tire Pace Signal:
Each tire is equipped with a sensor, which provides information about the speed of the tire. Preferable a heat resistant fiber optical sensor is used in combination with a heat resistant magnetic switch flag attached to the tire.

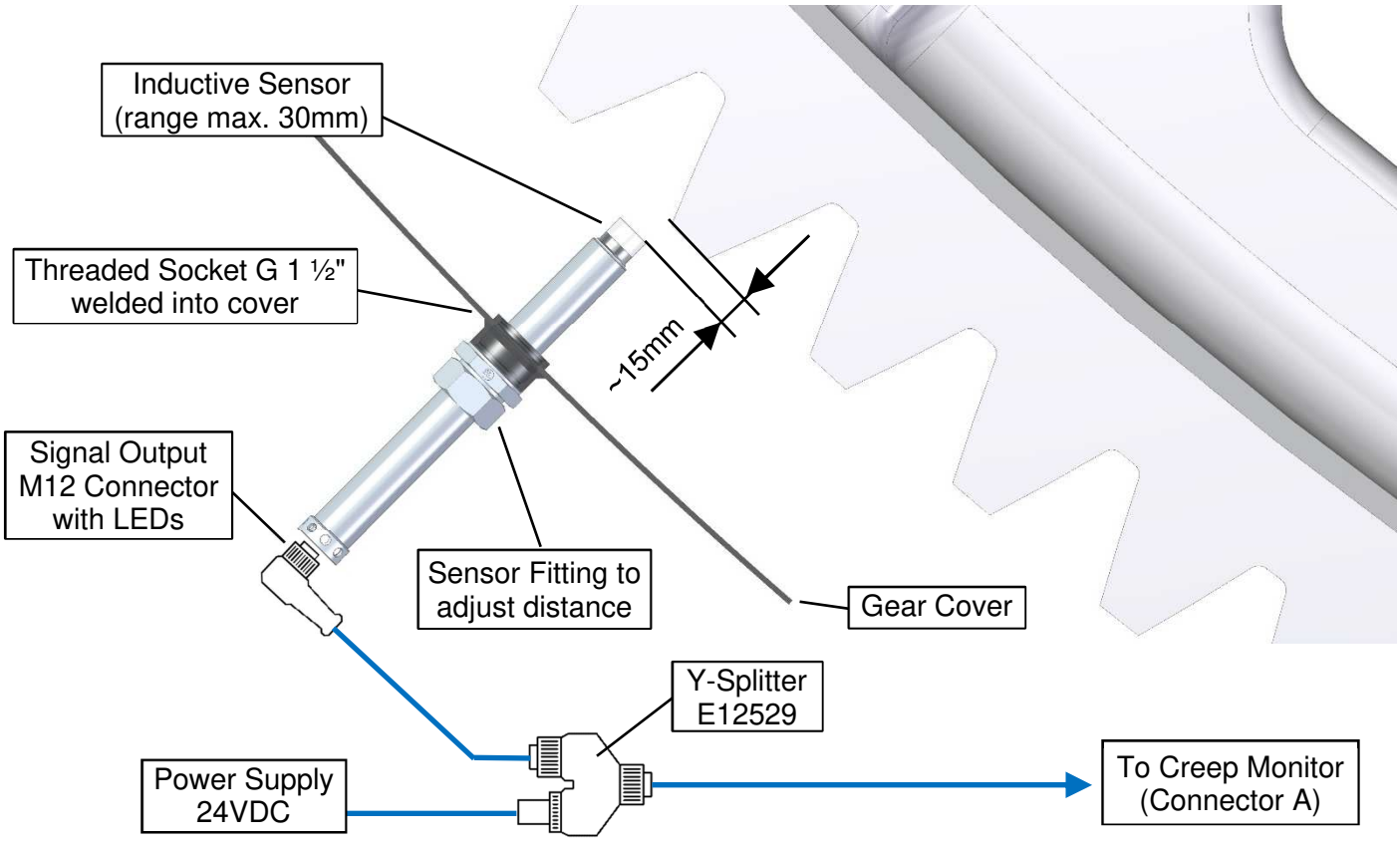
4 INSTALLATION

4.1 Gear Sensor

The Gear Sensor is an inductive sensor and is used to measure the kiln speed. It provides an electrical impulse each time a tooth is passing through the sensor range.

a) Look for a good location to place the Gear Sensor. It should be easily and save accessible, but out of the way of walk ways and not interfere with regular maintenance activities.
b) Make also sure, that the sensor gets installed in the middle of the tooth width and where no grease or oil will leak out.
c) When the place is identified, clean the area and remove the lubricant to avoid any risk for fire.
d) Cut a hole into the housing of the girth gear and weld a threaded socket (G 1½") onto the hole.
e) Clean and re-paint the area to avoid corrosion
f) Mount the Sensor Fitting into the threaded socket. Use anti seize grease to lubricate the fitting.
g) Insert the Gear Sensor into the fitting and adjust the required distance (~15mm) to the tooth tip
h) Lock the position by tightening the nut on the fitting
i) To assure that the sensor cannot move into the gear at any circumstance, add the lock ring in front of the nut
j) Connect the Gear Sensor to the Junction Box or place it with a Y-Splitter in the 24V power line going to the Creep Monitor (Connector A)

Fig. 4.1.1: Gear Sensor installed in housing of girth gear



4.2 Switch Flags

The Switch Flag consist of a strong heat resistant magnet (up to 300°C) and a rod made of stainless steel. One switch flag has to be attached on to the side face of the tire which needs to be measured.
Magnetic switch flags have two important advantages compared to welded or bolted switch flags:

- They are much safer for people; in case of interferences the magnet would let go.
- Welding or bolting on the tire is not recommended due to the risk for cracks

To attach the switch flag, respect the following points:

a) Identify the preferred side of the tire, where the Switch Flag and the Tire Sensor easily can be installed.
b) Look for a good location to place the Switch Flag and make sure there is no interference (e.g. with heat shields, thrust rollers, fixation blocks, thrust ring, …)
c) Make sure there is sufficient space between the Switch Flag and the kiln shell to place the tire sensor.
d) Clean the tire surface, if needed, to assure sufficient hold of the magnet
(**Note**: dust and dirt accumulation can substantially reduce the magnetic hold)

4.3 Tire Sensors

The Tire Sensor is a fiber optical sensor and is used to measure the speed of the tire. It consists of a light converter, which sends light through optical fibers and receives the reflected light back when the switch flag on the tire is passing in front of the lens. The light converter provides an electrical impulse to the Creep Monitor at each turn of the tire, when reflected light is received.

a) Look for a good location to place the Tire Sensor. It should be easily and safe accessible, but out of the way where regular access for maintenance is need.
b) To eliminate the risk that somebody gets trapped, place the tire sensor as much as possible out of the center against the sense of rotation, to keep the space between the rollers free for maintenance activities.
c) Install a stable pole made of a squared steel tube 60x60mm with a wall thickness of ~3mm.
d) Use the flange plates to bolt the poles onto concrete foundation
e) Bolt the bracket to the pole and install the Tire Sensor
f) Adjust the distance to the Switch Flag to be in the range of 20…50mm and make sure that the Tire Sensor has sufficient space in all direction and will not touch the kiln in any situation.
(**Note:** the kiln gets substantially longer during operation compared to cold condition)
g) Connect the Light Converter to the optical cable and place it in a "cool" area, protected from the heat radiation coming from the kiln and sunlight.
(**Note**: the temperature limit for the Light Converter is 85°C, but the exposed end of the Tire Sensor is heat resistant up to 180°C)
h) Connect the Light Converter with a sensor cable to the Creep Monitor (Connector C)

4.4 Creep Monitor Controller

The controller is water and dust tight, and made to be placed at the kiln piers. Nevertheless, make sure it is not exposed directly to the radiation from the kiln.
Install the heat shield if needed.
For quick installation the controller can be attached by strong magnets.
(Contact TomTom-Tools to discuss the options with magnets)
For bolting, use four M5 Allen bolts, going through the housing.
As an option, it is also possible to mount all the Creep Monitor controllers in one electrical cabinet together with the power source and the I/Os from the control system. The pier with the kiln drive might be a good place because there are often connections to the control system already available.

5 WIRING

The Creep Monitor is pre-wired from the terminal blocks on the circuit board to the M12 (A-coded) connectors in the housing.
The numbering and color coding is in Accordance with IEC 61076-2-101.

Pin No.	1	2	3	4	5
Color	Brown (BN)	White (WH)	Blue (BU)	Black (BK)	Grey (GY)
Connector A	Power Input 12…30VDC	Signal Output 4…20mA “Creep”	GND	Shell Pace Signal Input	n.c.
Connector C	Gear Sensor Power Supply	n.c.	GND	Tire Pace Signal Input	n.c.

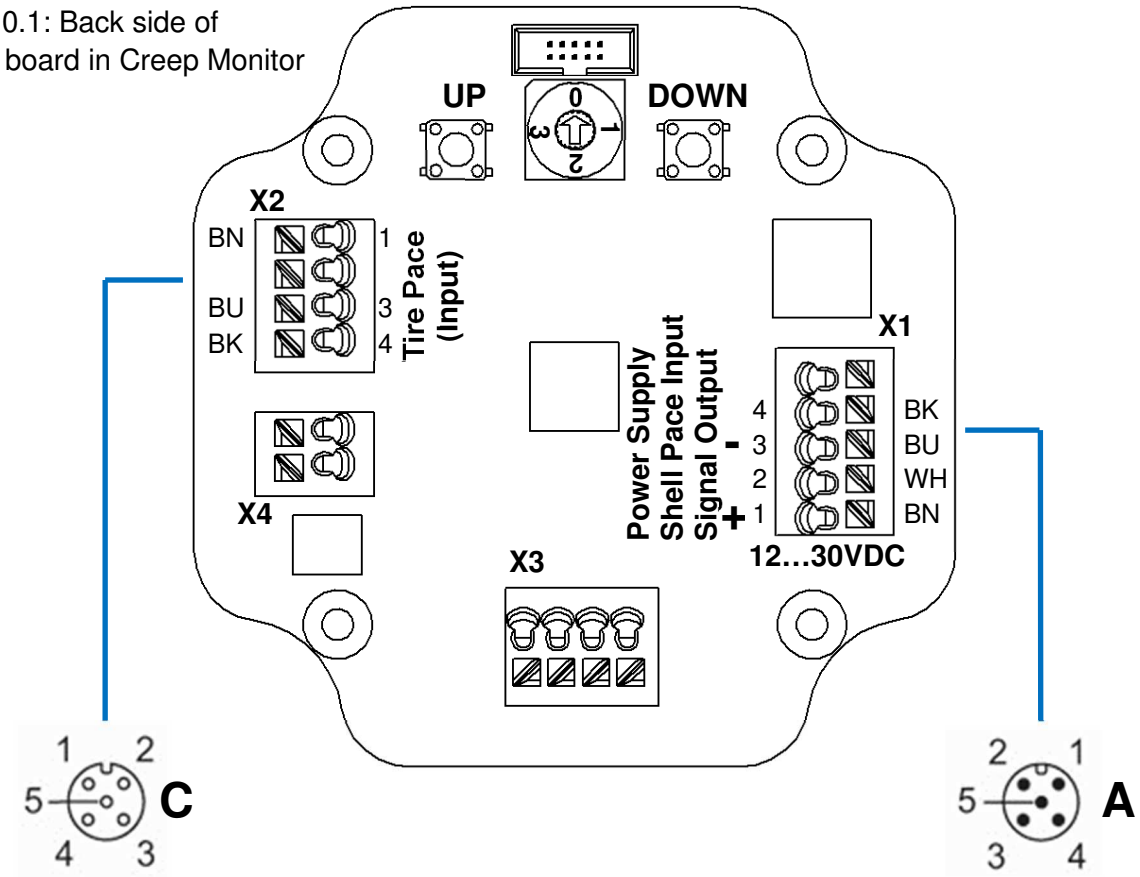


Fig. 5.0.1: Back side of circuit board in Creep Monitor

5.1 Star Wiring (typical)

The typical wiring is done by feeding the units from a centralized point (e.g., from an electrical cabinet or a junction box).
All the different parts of the MKM2 System (Crank Monitor, Creep Monitor and Travel Monitor) can be connected to the same junction box. Each controller is powered and supplied with the shell pace through an individual cable through which also the analog output signal is sent back to the junction box.

Fig. 5.1.1: Star Wiring (Option 1)

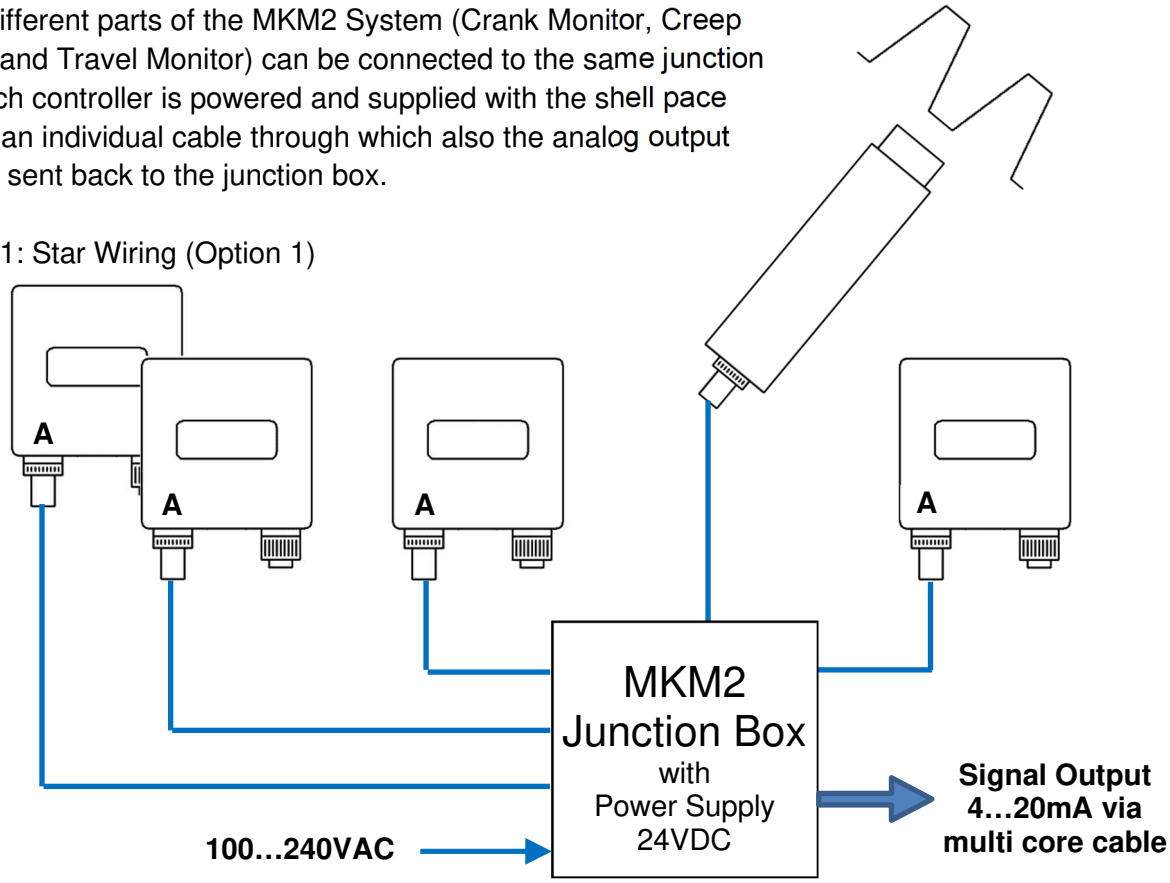
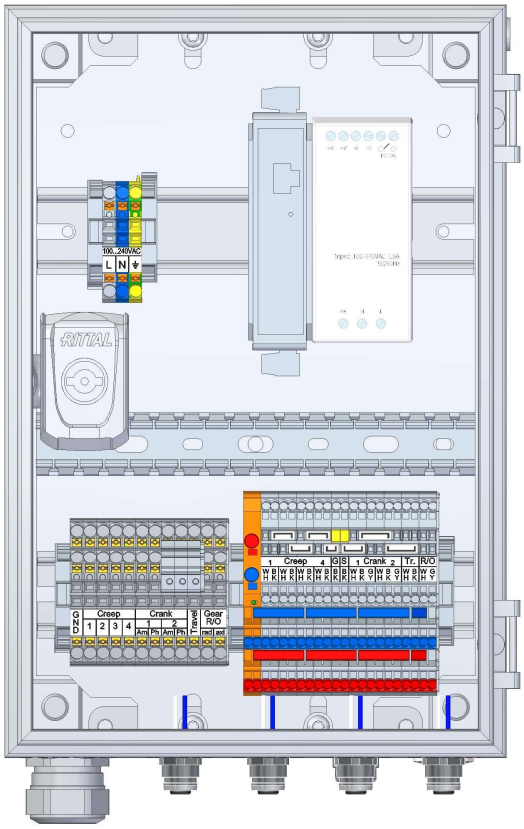


Fig. 5.1.2: MKM2 Junction Box (optional)
A pre-wired junction box with 24VDC power supply is available. It is compact, does not require much space and is equipped with M12 connectors, which make the installation very easy and quick.

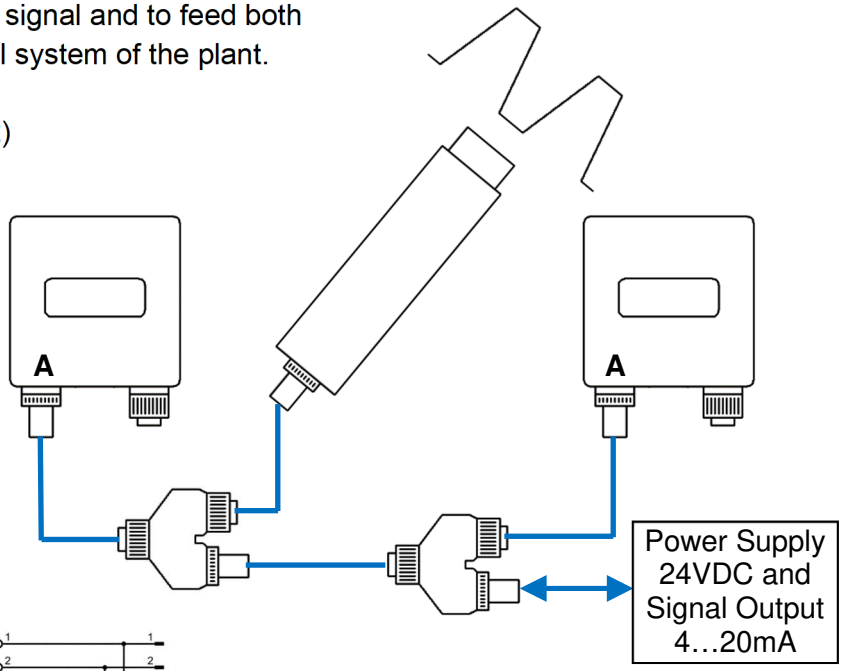
More details about the wiring can be found in the Chapter 7.



5.2 Lean Wiring (for max. 2 piers)

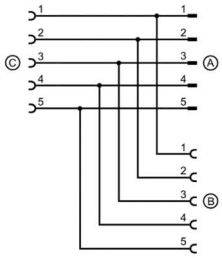
Up to two Creep Monitor systems can be connected without MKM2 Junction Box via a single cable, passing from one unit to the other. The cable with the 5 pins is sufficient to supply the power, the shell pace signal and to feed both output signals back to the control system of the plant.

Fig. 5.2.1: Lean Wiring (Option 2)



To connect the different members to the same line, use the following Y-Splitter M12-A, 5 wire
(IFM E12529)

Fig. 5.2.2: Y-Splitter



Note:
If the creep output signals of both Creep Monitor have to be transmitted by the same 5 pin cable, one of the outputs need to be re-routed to Pin 5 and the other wire needs to be disconnected and isolated!

Fig. 5.2.3: **Tire 1** Output Signal on **Pin 2**
(Disconnect and isolate the grey wire)

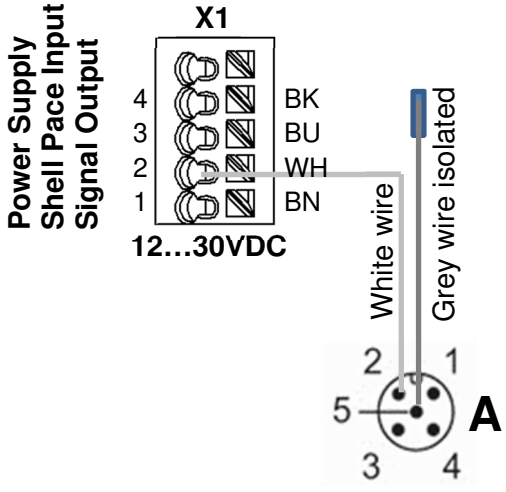
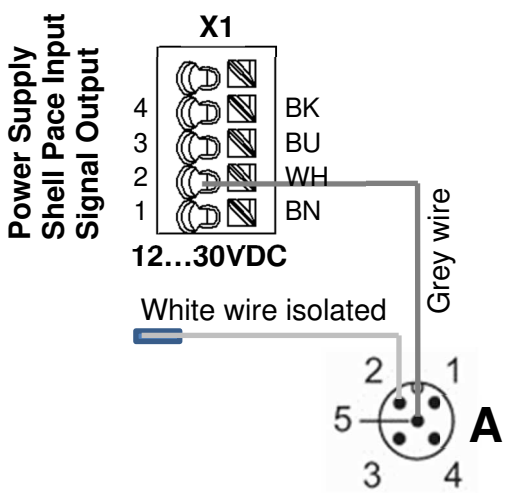
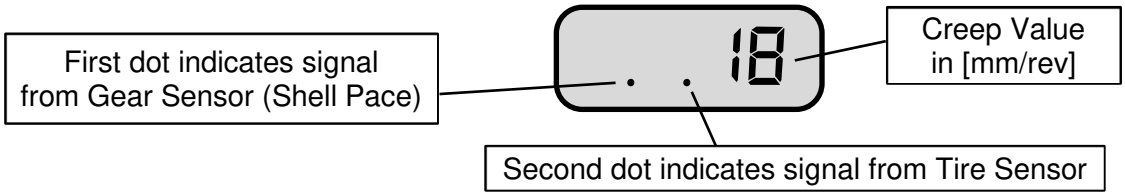


Fig. 5.2.4: **Tire 2** Output Signal on **Pin 5**
(Disconnect and isolate the white wire)



5.3 Power Supply

Only one single 24VDC (1A) power source is required for all Creep Monitor units on a kiln. By using the MKM2 Junction box, the 24V power supply converter is already included, hence 100…240VAC is required.



5.4 Shell Pace

The rotation signal of the kiln, the Shell Pace, is provided by the Gear Sensor as shown in Fig. 4.1.1. The Shell Pace signal is fed to the different controllers via pin 4 (black wire). All Creep Monitor controller are using the same signal.

In case the Shell Pace signal is missing, the following error message will be displayed.

Fig. 5.4.1: Error Message

Note:
It is also possible to use other signals as Shell Pace. It could go from 1 impulse per turn, given by a single switch flag welded to the kiln shell, up to a few thousand impulses taken at the shaft of the main motor.
The disadvantage of having only a low number of pulses is that the measurement is disturbed during changes of the kiln speed. Having too many pulses makes the signal less stable. That is why we recommend to use the teeth of the girth gear as reference.

5.5 Tire Pace

The rotation signal of the tire, the Tire Pace, is provided by the Light Converter of the Tire Sensor as shown in Fig. 3.0.1. The power for this sensor is supplied from the individual controllers (Connector C). The Tire Pace signal is fed back on pin 4 (black wire) to the Creep Monitor.
In case the Tire Pace signal is missing, the following error message will be displayed.

Fig. 5.5.1: Light Converter connected to Creep Monitor

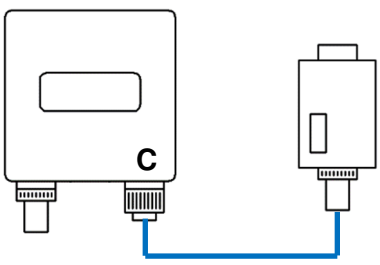


Fig. 5.5.2: Error Message

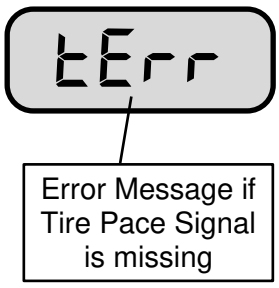
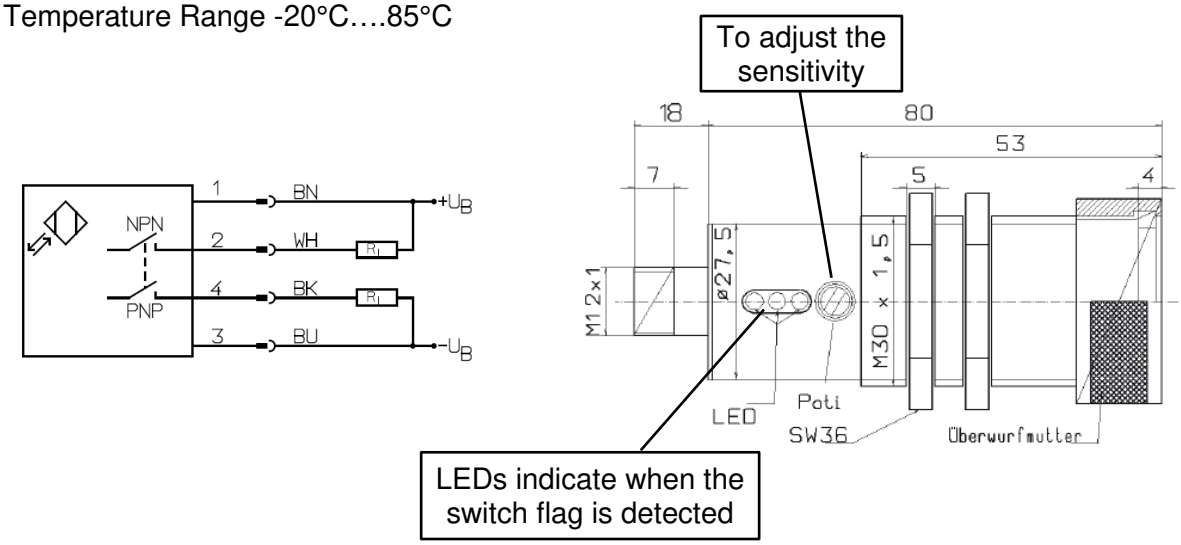


Fig. 5.3.3: Light Converter SPM-35-594-X85

Input Voltage (U_B) 10…36VDC
Temperature Range -20°C….85°C

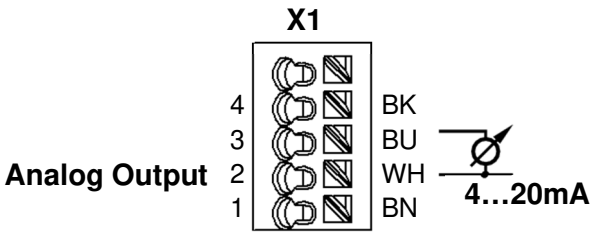


5.6 Signal Output

The output of the Creep Monitor is the creep in mm/rev as a 4…20mA analog signal.
It is provided at the terminal block X1 on Pin 2.

4mA → 0mm/rev
20mA → 48mm/rev

In case of standard wiring, the output signal is connected to Pin 2 (white wire) on plug A as shown in Fig. 5.2.3.

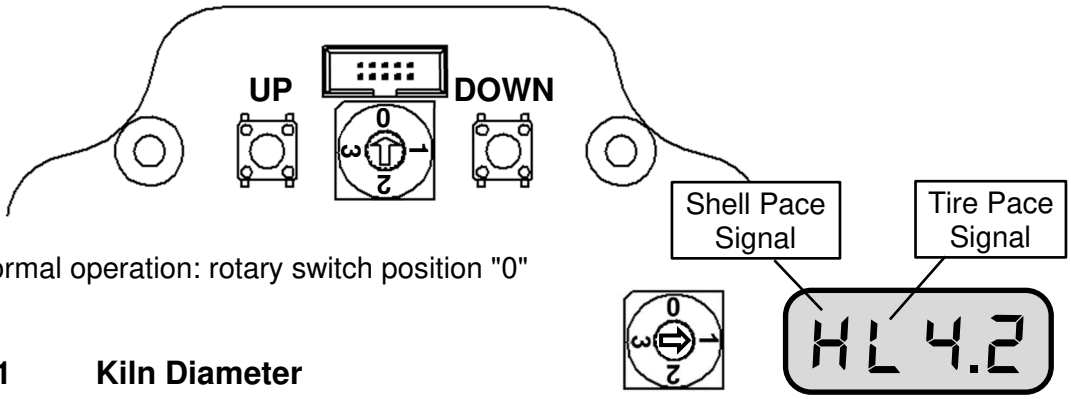


The current loop is based on the common ground (GND) on all terminal blocks and on Pin 3 (blue wire)

Note:
In case the creep cannot be calculated or if there is an issue with one of the sensors, the display will show Stop, - - - - , or Error and the output signal will be at the maximum of 20mA.

6 CONFIGURATION

The Creep Monitor can easily be configured by using the rotary switch to select the parameter and the UP and DOWN button to change the value.



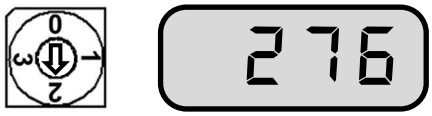
Normal operation: rotary switch position "0"

6.1 Kiln Diameter

To adjust the kiln diameter, turn the rotary switch to the position 1.
The display will show the diameter in meter; here as an example [4.2m].
To change the value, push the UP or DOWN button as required.
(possible range: 1.0 to 9.9m)
Use the diameter at the outside of the tire pads or the inner diameter of the tire.

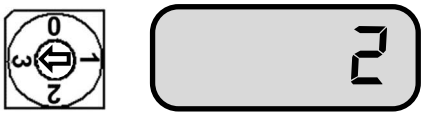
Note:
In this mode, the signals of the Shell Pace sensor (1st from left)
and the Tire Pace sensor (2nd from left) are displayed as well.
H: high, L: low

6.2 Number of Pulses per Kiln Turn



To adjust the number of pulses per kiln rotation, turn the rotary switch to the position 2.
When the Gear Sensor is used, adjust the number to the number of teeth on the girth gear.
Here in the example the girth gear has 276 teeth.
To change the value, push the UP or DOWN button as required.
(possible range: 1 to 9999 pulses per kiln turn)

6.3 Signal Smoothing Filter



The Creep Monitor is equipped with a filter function to smoothen the output signal.
Normally filtering should not be required and the value can remain on 1.
A value of 2, as in the example, means that the output signal is the average of the last two turns. A value of 5 will provide an average of the last five kiln turns; and so on.
To adjust the filter, turn the rotary switch to the position 3.
To change the value, push the UP or DOWN button as required. (possible range: 1 to 9)

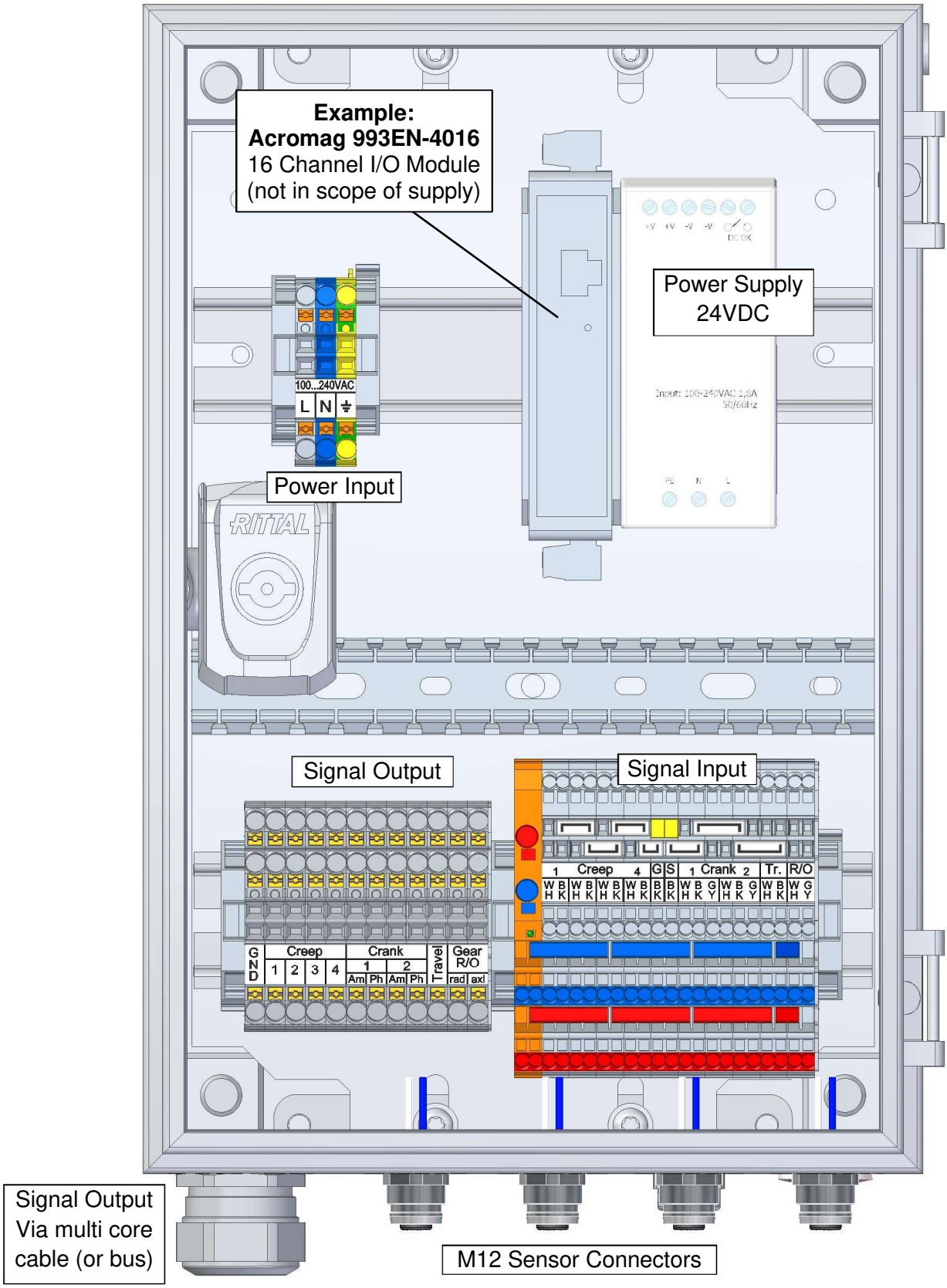
Note: By activating the filter, the output signal reacts delayed, which might be risky during startup of the kiln.

7 JUNCTION BOX

Dimensions:
200x300x155mm

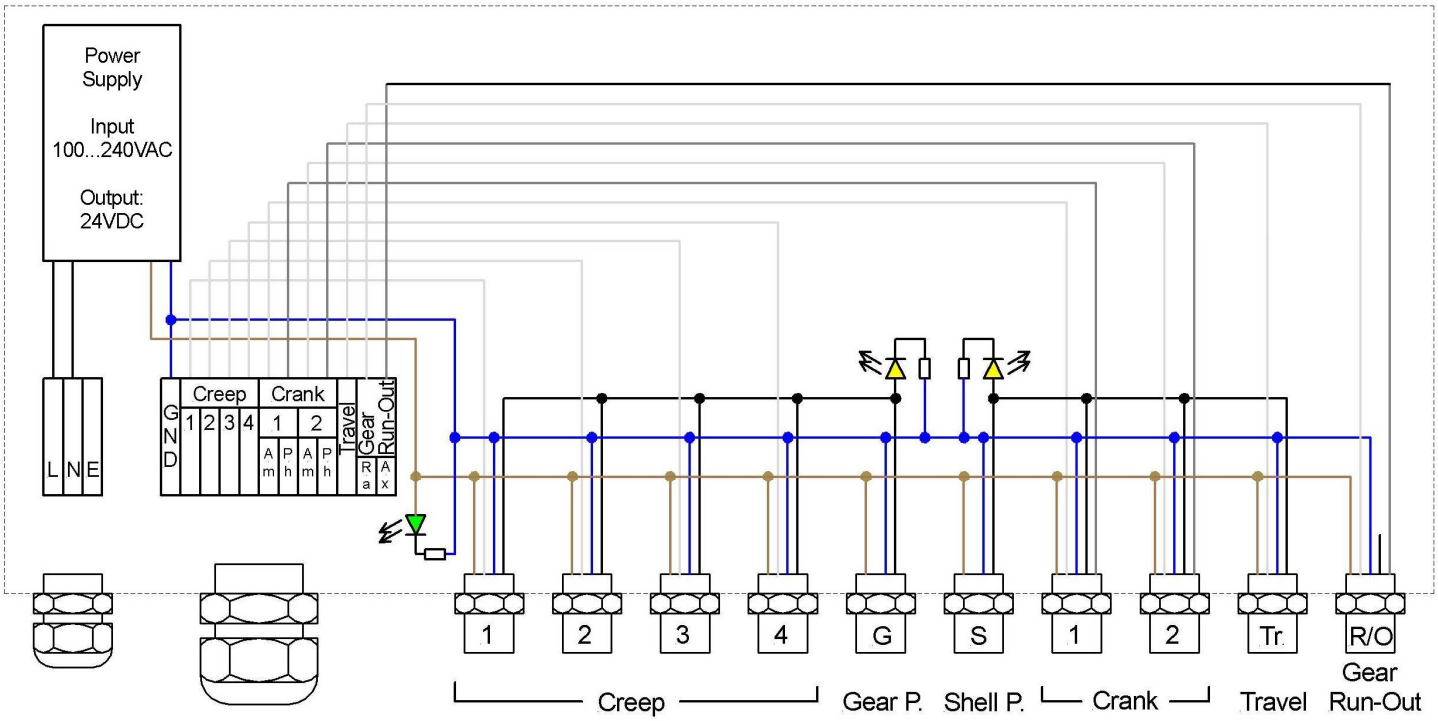
7.1 Layout

The following picture shows a fully equipped MKM2 Junction Box which is suitable to combine Crank Monitor, Creep Monitor, Travel Monitor and the Girth Gear Run-Out Monitor system. The box also offers space to add a serial protocol interface, e.g. Acromag 993EN-4016 or another I/O module.



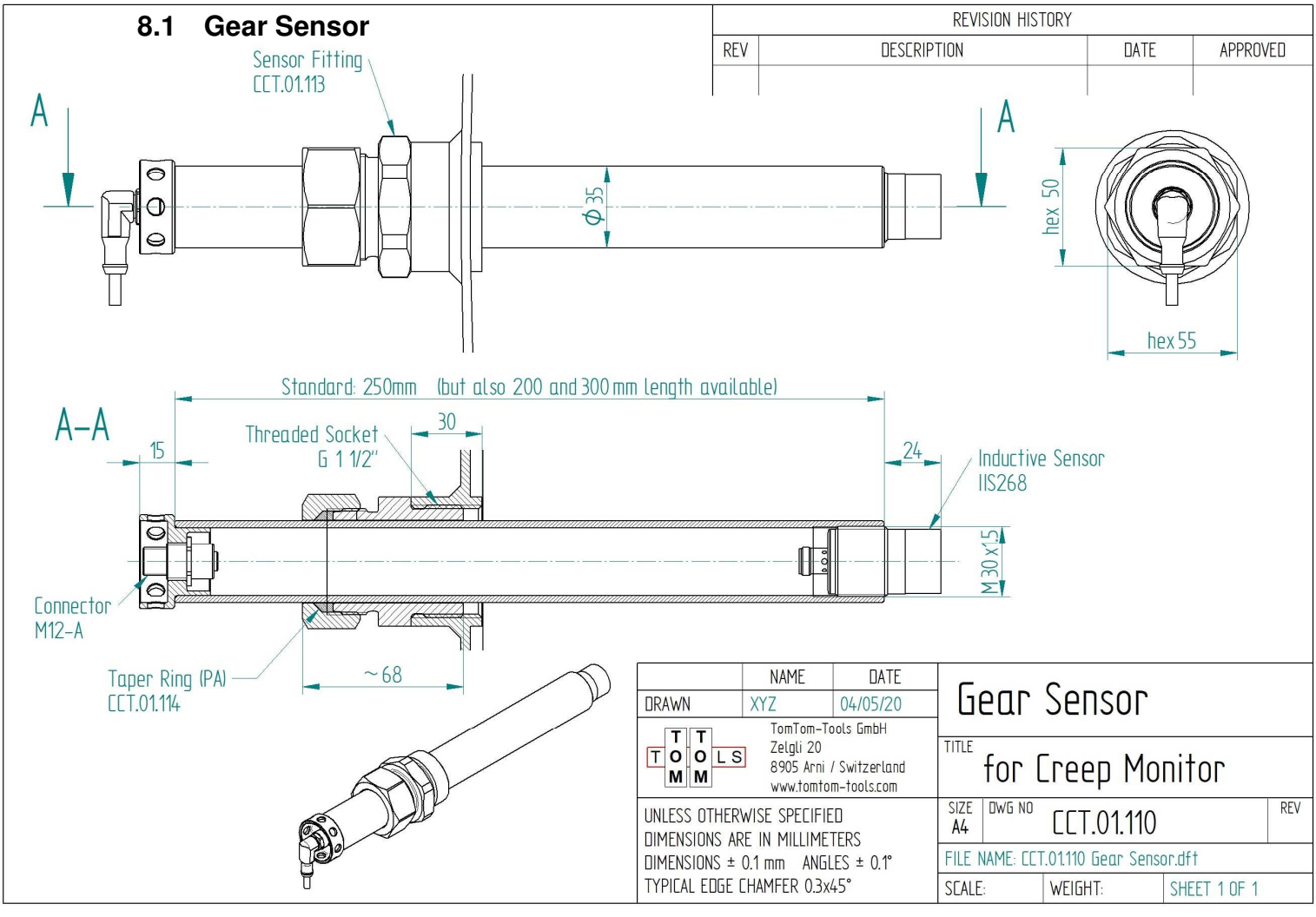
7.2 Schematic (typical configuration)

This configuration of the MKM2 Junction Box suits for Creep Monitor (4 Tires), Crank Monitor (2 Tires), Travel Monitor and Run-Out Monitor (Girth Gear)



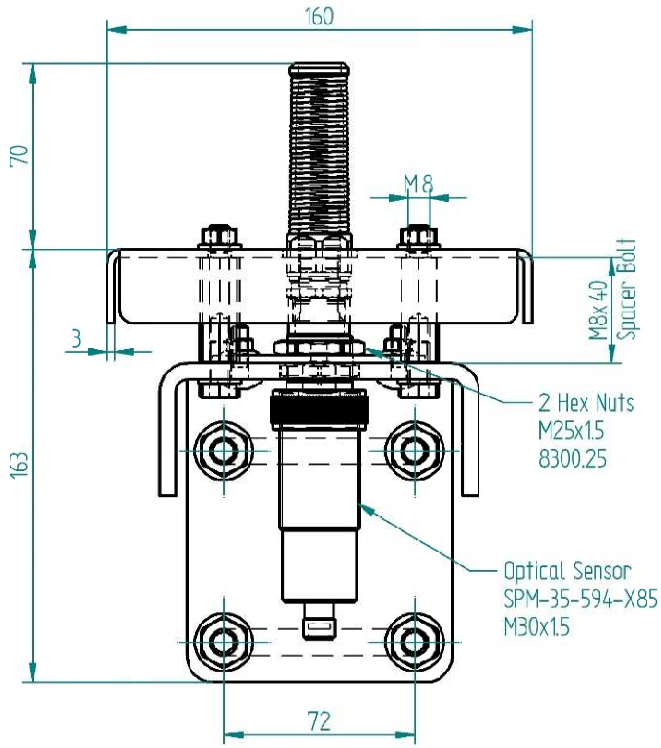
8 DRAWINGS

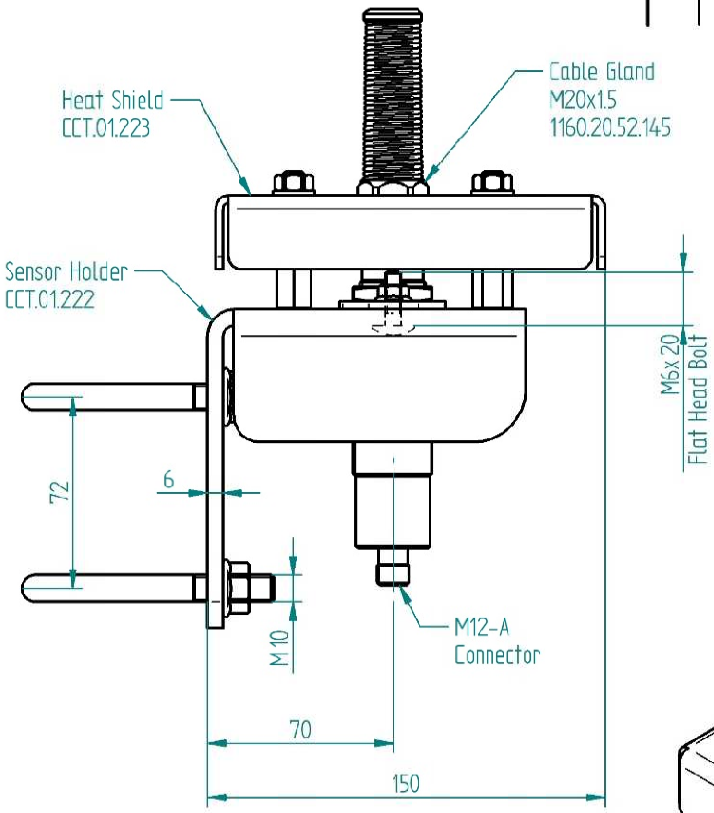
8.1 Gear Sensor

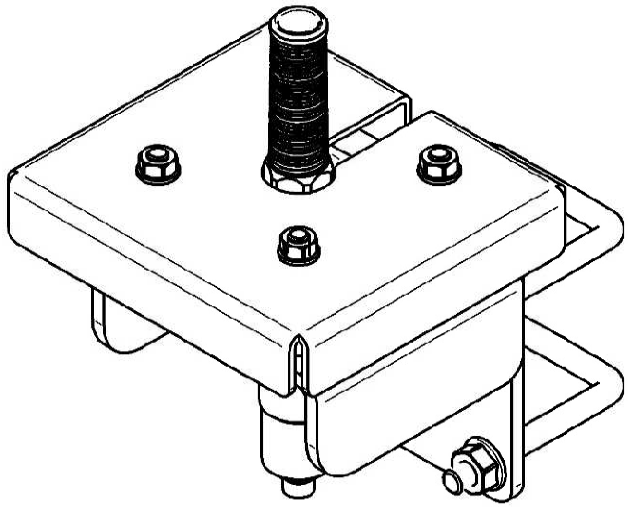


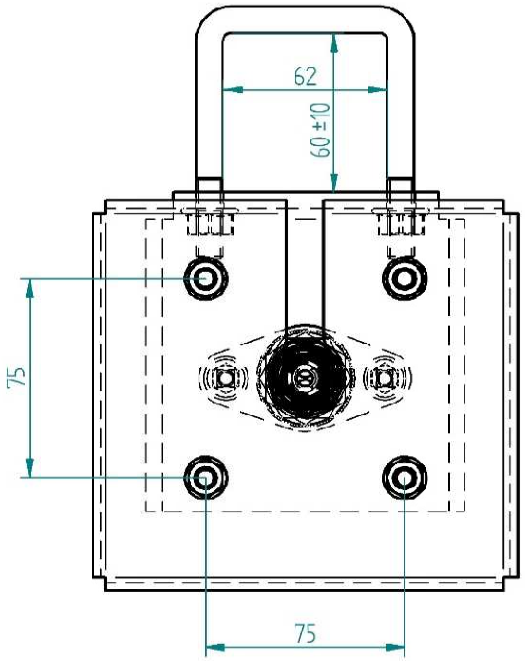
8.2 Light Converter

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED









	NAME	DATE
DRAWN	XYZ	12/16/20

TomTom Tools GmbH
Zelgli 20
8905 Arni / Switzerland
www.tomtom-tools.com

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
DIMENSIONS ± 0.1 mm ANGLES ± 0.1°
TYPICAL EDGE DIAMETER 0.3x45°

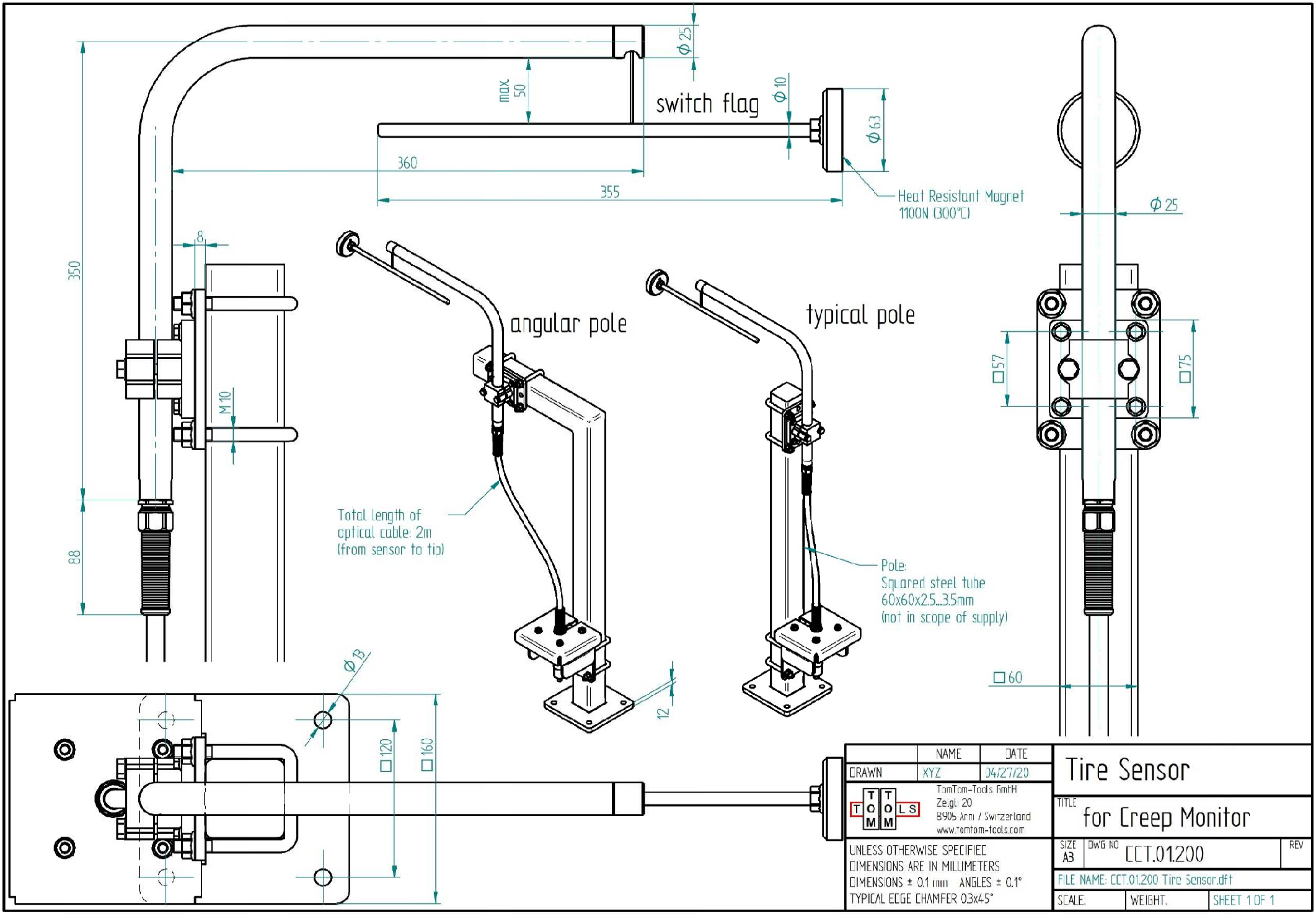
Optical Sensor

TITLE: for Creep Monitor

SIZE	DWG NO	REV
A3	CCT.01.220	

FILE NAME: CCT.01.220 Optical Sensor.dft

SCALE:	WEIGHT:	SHEET 1 OF 1



	NAME	DATE
DRAWN	XYZ	04/27/20

TomTom-Tools GmbH
Zelgli 20
8905 Arni / Switzerland
www.tomtom-tools.com

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS
DIMENSIONS ± 0.1 mm ANGLES ± 0.1°
TYPICAL EDGE CHAMFER 0.3x45°

Tire Sensor

TITLE: for Creep Monitor

SIZE	DWG NO	REV
A3	CCT.01.200	

FILE NAME: CCT.01.200 Tire Sensor.dft

SCALE:	WEIGHT:	SHEET 1 OF 1