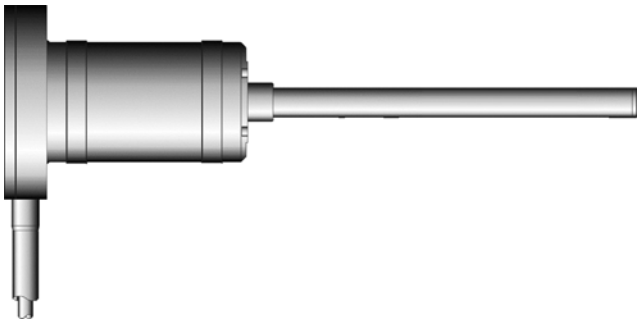
KELK
Sensors for Rolling Mills

ABSOLUTE DISPLACEMENT TRANSDUCER INTERNAL - Model P619

Description and Specifications DS.ADT.809.2

1. DESCRIPTION



KELK Absolute Displacement Transducers (ADTs) are cost effective linear displacement transducers which provide precise position measurement in harsh industrial environments.

Housed inside each stainless steel transducer package is a rugged non-contact sensor operating on the magnetostriction principle. The operating principle is based on the time difference between the initiation of an interrogation pulse and the detection of a return pulse. The measured time interval is directly converted into a position reference by the sensor.

The ADT Model P619 consists of two separate parts - a sensing element and a magnet assembly. The transducer housing mounts directly to a hydraulic cylinder body or mill stand screw housing, while the magnet mounts directly to a piston or screw, respectively.

The sensor cable exits the ADT assembly through a steel reinforced hydraulic hose that includes fittings for direct connection to a junction box or enclosure.

A large variety of output options enable the sensor to be connected directly as a position feedback reference to meters or PLC's, or it can be coupled through third party interface/data acquisition cards.

2. APPLICATIONS

Absolute Displacement Transducers are suitable for precise position control applications throughout the metals rolling process, including:

- Hydraulic cylinder position feedback
- Sideguide positioning
- Screw movement monitoring and control

3. FEATURES

3.1 **Measurements are absolute**, and, unlike incremental transducers, are not affected by velocity peaks, or electrical or magnetic noise.

3.2 It is not necessary to re-establish a ‘zero’ reference point after loss of power.

3.3 **High resolution** and **good linearity** provide the accuracy required for modern rolling mill AGC systems.

3.4 **Heavy duty** stainless steel construction is standard.

3.5 **Sealed enclosures** provide protection against mill fluids and other contaminants and can be custom-designed to replace existing sensors.

3.6 **A variety of output options** are available: Serial Synchronous Interface (SSI), Analog (voltage or current), Ethernet, CANbus, DeviceNet, or Profibus.

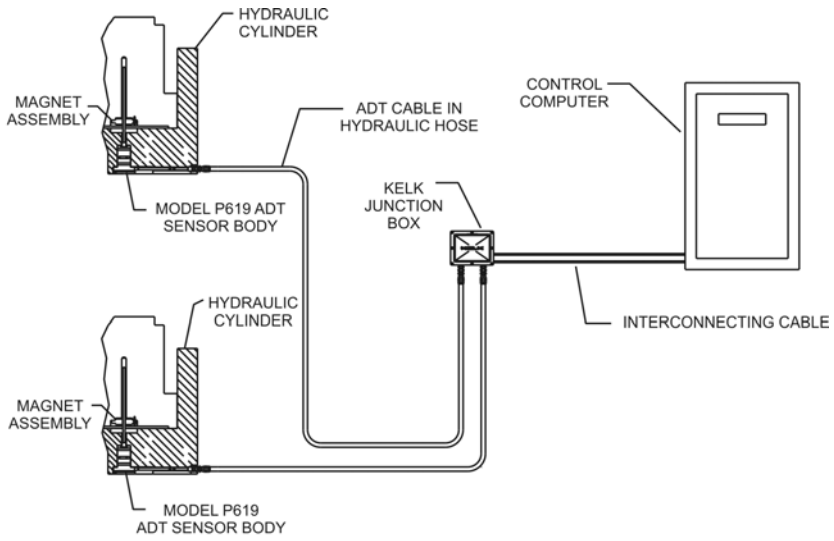
3.7 Each ADT is fitted with a permanently attached 6 meter (20 foot) long cable as standard (other lengths are available).

3.8 **ADTs can be connected directly to meter or a PLC**; no external processing electronics are required.

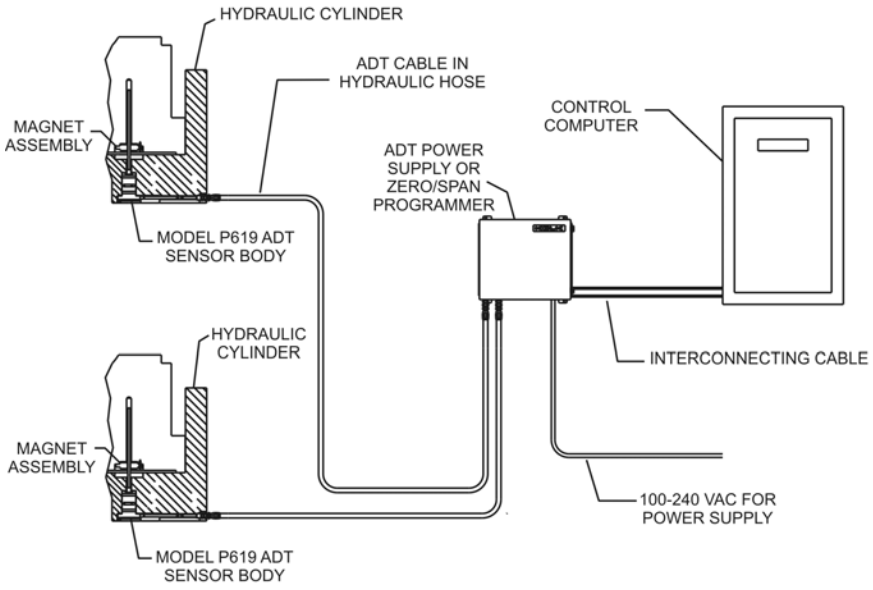
3.9 **Optional electronics are available for remote setting of zero and span** (Analog output type only).

3.10 **A velocity signal is optional** as a second output (same output type as the position output selected).

4. SYSTEM CONFIGURATION



SYSTEM SCHEMATIC, 24 VDC AVAILABLE IN THE MILL



SYSTEM SCHEMATIC, WITH ADT POWER SUPPLY OR ANALOG ZERO/SPAN PROGRAMMER OPTIONS

4.1 **Mill Mounted Parts**

4.1.1 **ADT Sensor Body**

The ADT Sensor Body includes the main housing where the head of the sensing element is located, as well as the rod that extends from the main housing. A cable is permanently attached for powering the sensor and transmitting data back to the PLC, meter or mill computer.

The housing is typically mounted in a machined cavity in the top of a hydraulic cylinder, or a mill stand, if it is used for measuring screw position. The rod extends into a hole machined into the hydraulic piston or screw.

4.1.2 **Magnet Assembly**

The magnet assembly is secured to the top of the screw or hydraulic piston via 3 cap screws (M6 or 1/4”-28).

4.1.3 **ADT Power Supply**

The ADT sensor requires 24 VDC supply power. Newer mill PLC’s may have such a supply, and therefore may not need a supplemental power supply. However, KELK can provide a 24 VDC power supply if no such power is available on-site. The power supply accepts a 100-240 VAC input and is provided in a NEMA 12 enclosure, which can be mounted on top of the mill stand. It is recommended that one supply be used for each mill stand (i.e. one for every pair of P619 sensors). An

interconnecting cable is used to transmit the sensors' signals from the enclosure to the mill PLC.

4.1.4 **Zero/Span Programmer (Analog output type only)**

If Analog is the chosen output type, KELK offers an optional module which can be used to remotely set the zero and span of the sensor over the operating stroke of the hydraulic piston or screw. This option includes the ADT Power Supply described in section 4.1.3 above.

4.1.5 **Junction Box**

If the mill has a 24 VDC power supply and the KELK ADT Power Supply described in section 4.1.3 is not used, a standard KELK junction box is recommended for connecting the sensor cables to interconnecting cables that run from the mill stand to the control room.

4.1.6 **Documentation**

Two user manuals, including drawings, are provided in English.

4.2 **Scope of Supply** (per mill stand)

4.2.1 **Standard Equipment**

2 ADT Sensors (one sensor per hydraulic cylinder, screwdown, or sideguide), with standard 6 m (20 ft) long cable. Output type is factory-set with one of the following options: Serial Synchronous Interface (SSI), Analog (voltage or current), Ethernet, CANbus, DeviceNet, or Profibus.

2 Magnet Assemblies

1 Junction Box **or** ADT Power Supply with Enclosure **or** Zero/Span Programmer with Enclosure

4.2.2 **Optional Equipment**

1 Junction Box (if ADT Power Supply or Zero/Span Programmer with Enclosure is chosen as part of standard equipment)

5. SPECIFICATIONS

5.1 GENERAL

5.1.1 Displacement ranges: 50 to 1000 mm (2” to 40”)

5.1.2 Minimum sensor length: 252 mm (9.9”) plus stroke

5.1.3 Repeatability: Better than ± 0.001% of Full Stroke, or 2.5 µm (0.0001”), whichever is larger

5.2 OUTPUTS

	Output Options (choose one for each transducer)					
	SSI[1]	**Analog (Voltage or Current[2,3])**	**Ethernet[1]**	**CANbus[1]**	**DeviceNet[1]**	**Profibus[1]**
Supply Voltage	24 VDC (-15 / +20 %)					
Typical Minimum Resolution	1 µm = 0.00004”	0.0015% of Full Stroke (min. 1 µm =0.00004”)	1 µm = 0.00004”	2 µm = 0.00008”	2 µm = 0.00008”	5 µm = 0.00020”
Non-Linearity	<±0.01% of Full Stroke (min. 40 µm = 0.0016”)	<±0.01% of Full Stroke (min. 50 µm = 0.0020”)	<±0.01% of Full Stroke (min. 50 µm = 0.0020”)	<±0.01% of Full Stroke (min. 40 µm = 0.0016”)	<±0.01% of Full Stroke (min. 40 µm = 0.0016”)	<±0.01% of Full Stroke (min. 50 µm = 0.0020”)
Hysteresis	< 4 µm, 2 µm typical	< 4 µm = 0.00016”				
Temperature Coefficient	< 15 ppm per °C	< 30 ppm per °C	< 15 ppm per °C			
Operating Temperature Range	-40° C to 75°C (-40°F to 167°F)					

1 Output is digital and absolute. Zero and Span must be referenced in the PLC or mill computer.
2 Analog output format to be specified at time of ordering; select one of the following 8 formats:
Voltage formats: 0 to 10, 10 to 0, -10 to +10, or +10 to -10 VDC
Current formats: 4 to 20, 20 to 4, 0 to 20, or 20 to 0 mA
3 Zero and Span adjustable with optional electronics

6. WHAT USERS MUST PROVIDE

6.1 Cavity machined in hydraulic cylinder or mill housing to allow mounting of the ADT body.

6.2 Machined surface on screw or hydraulic piston for mounting the magnet assembly.

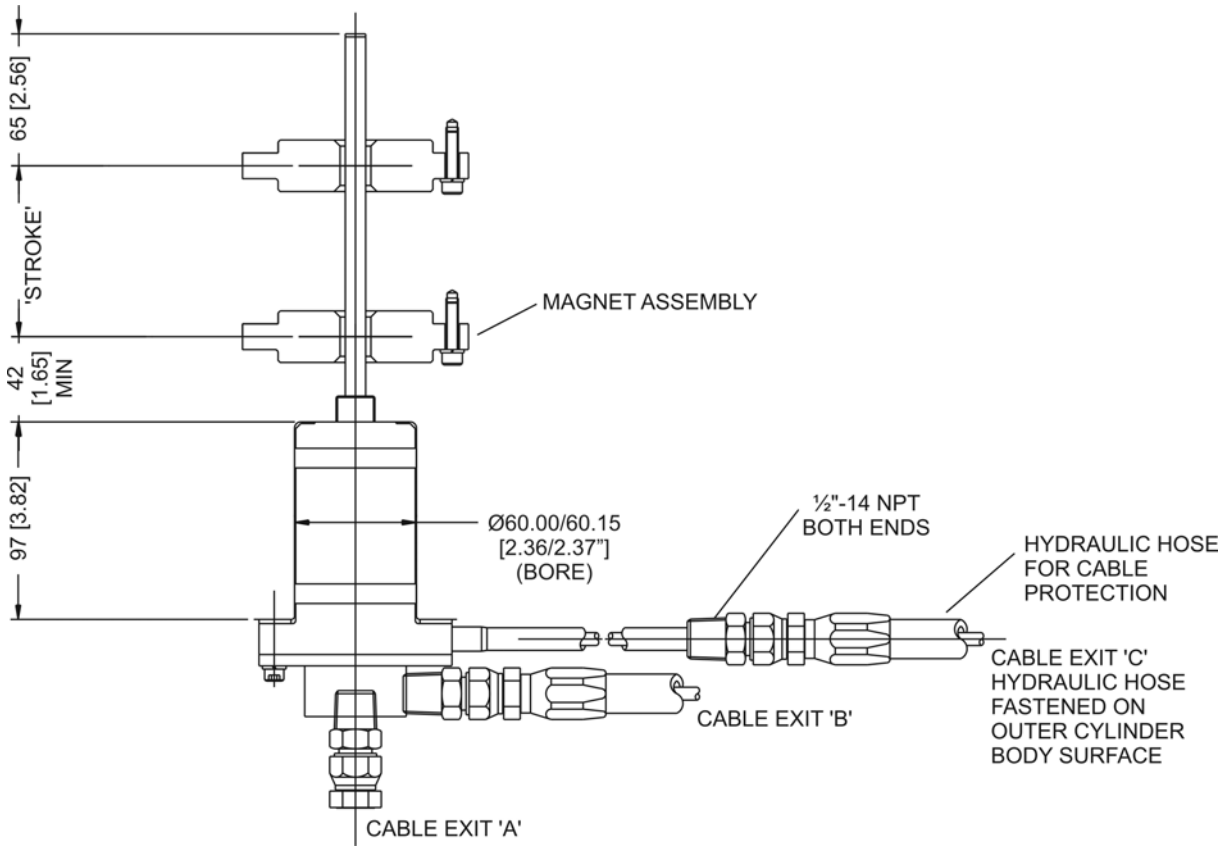
6.3 Hole bored in screw or hydraulic piston to accommodate the sensor rod

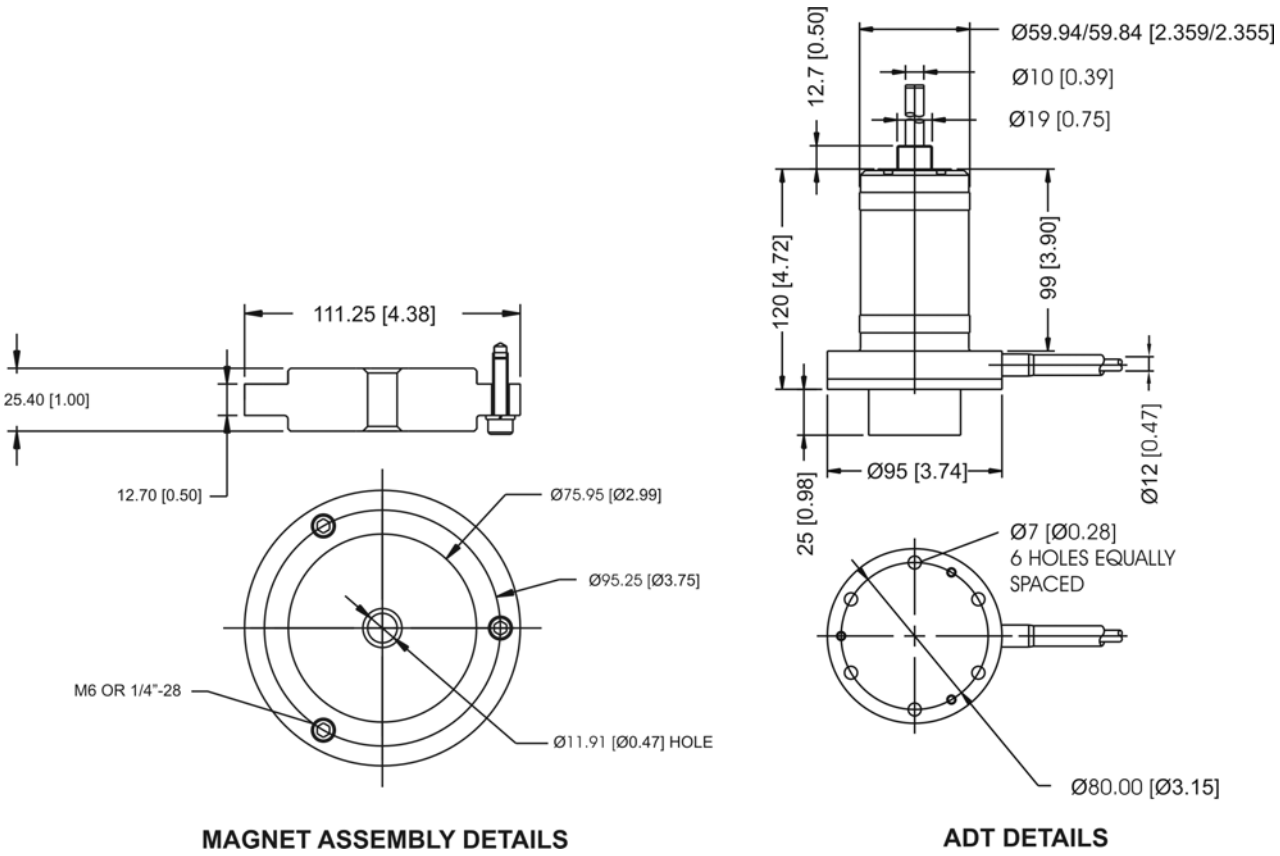
6.3 A 24 VDC supply to power the sensor. Alternatively, a power supply can be ordered as an option from KELK.

6.4 Selection of an ADT output type (SSI, Analog, Ethernet, CANbus, DeviceNet, or Profibus)

7. DIMENSIONS

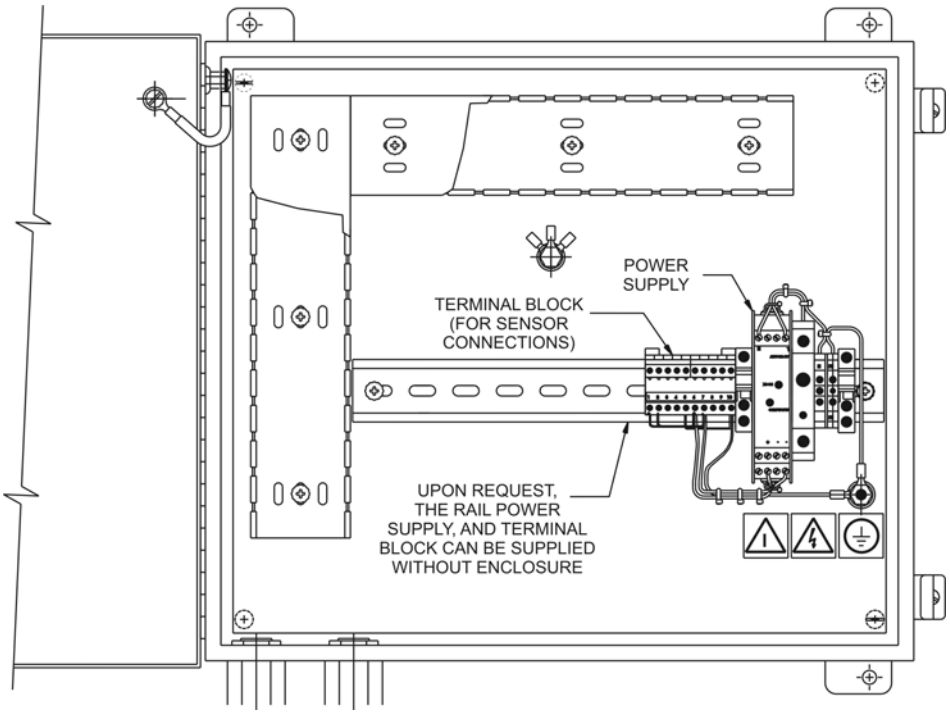
7.1 ADT MODEL P619 DETAILS AND DIMENSIONS



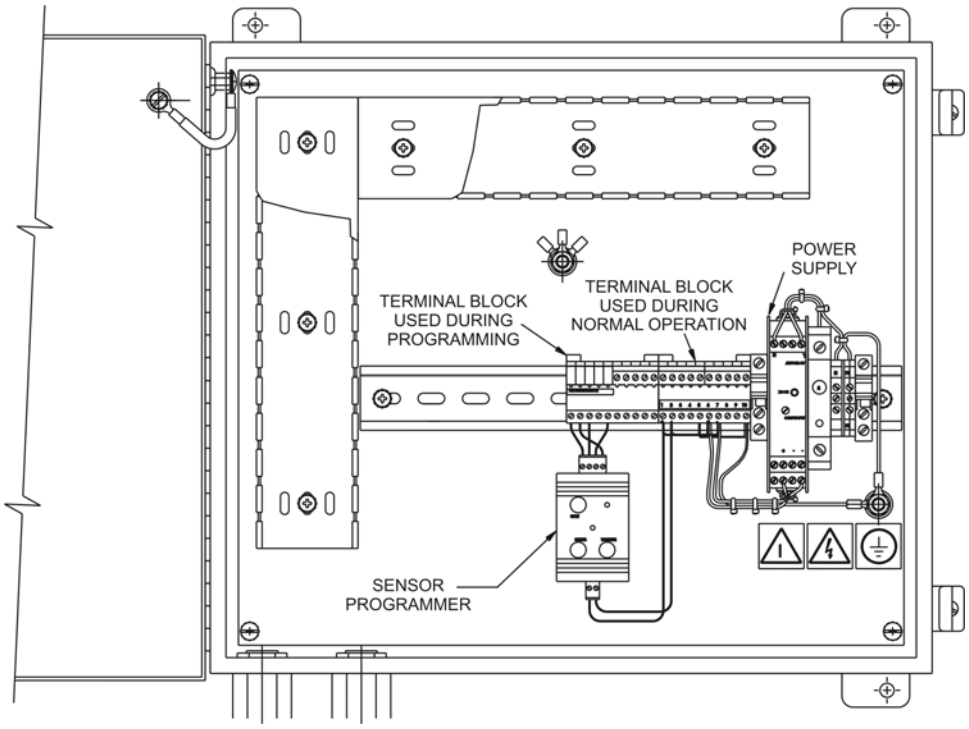


MAGNET ASSEMBLY DETAILS **ADT DETAILS**

7.2 ADT POWER SUPPLY ENCLOSURE DETAIL



7.2.1 ANALOG ZERO / SPAN PROGRAMMER WITH POWER SUPPLY DETAILS



7.3 ADT POWER SUPPLY ENCLOSURE DIMENSIONS